



NEW JERSEY'S COMPREHENSIVE CLIMATE ACTION PLAN

GLOBAL WARMING RESPONSE ACT 80X50 REPORT
2025 UPDATE



NEW JERSEY
DEPARTMENT OF
ENVIRONMENTAL
PROTECTION



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The New Jersey Comprehensive Climate Action Plan is the second deliverable for the U.S. Environmental Protection Agency's Climate Pollution Reduction Grant program and serves to guide implementation of the State's emission reduction efforts. This plan is issued with special thanks to Governor Phil Murphy and the Department of Environmental Protection Commissioner Shawn M. LaTourette. It would not have been possible without the tireless work of state agency leadership, staff and other professionals dedicated to meaningful climate action.

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EXECUTIVE SUMMARY

INTRODUCTION

Under the administration of Governor Phil Murphy, New Jersey has made remarkable progress toward meeting the State's climate mitigation goal of reducing emissions 80% by 2050. Five years ago, New Jersey's Global Warming Response Act 80x50 Report (NJDEP, 2020) summarized the consequences of inaction that awaited if rapid steps were not taken and, in conjunction with the New Jersey Board of Utilities' (NJBPU) 2019 New Jersey Energy Master Plan (NJBPU, 2019), laid out a clear pathway to achieve the major emissions reductions necessary to meet those goals.

Today, the State's climate policies have taken shape in the form of tangible laws, regulations, incentive programs and a host of supportive, community-based initiatives. This Comprehensive Climate Action Plan (CCAP) documents progress, identifies gaps, and introduces new actions to bring New Jersey closer to achieving the 80x50 objective.

About CPRG

The Climate Pollution Reduction Grant (CPRG) program is a nationwide, two-phase United States Environmental Protection Agency (USEPA) grant funded by the Inflation Reduction Act. Phase 1 provided \$250 million in noncompetitive planning grants to states and other entities to develop climate action plans for reducing greenhouse gas emissions and other harmful air pollutants. Phase 2 provided \$4.6 billion in competitive grants to implement priority measures included in States' Climate Action Plans.

New Jersey's Priorities

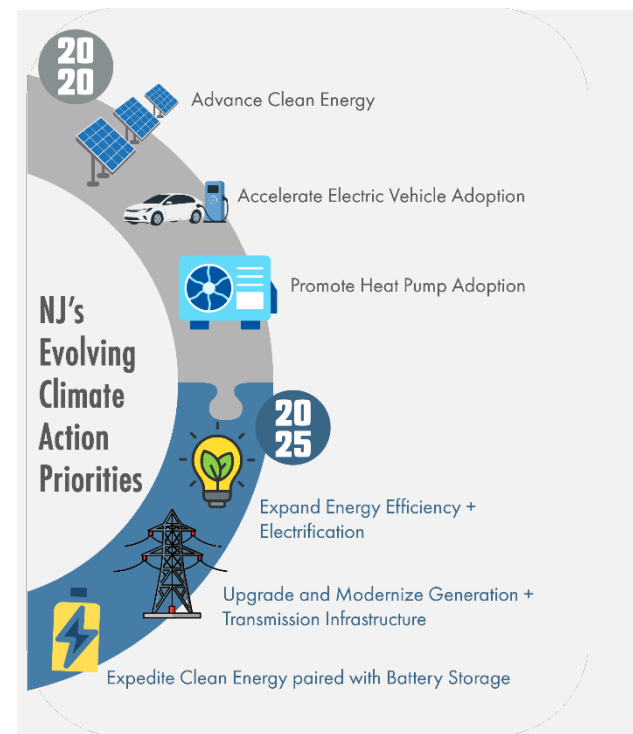
In 2024, the State of New Jersey developed its Priority Climate Action Plan (PCAP) under a Phase 1 CPRG grant (NJDEP, 2024). That plan identified six focus areas: 1) Transportation, 2) Residential and Commercial Buildings, 3) Electric Generation, 4) Food Waste, 5) Halogenated Gases, and 6) Natural and Working Lands. The emissions reduction strategies identified in the PCAP were chosen to target high-priority opportunities to reduce greenhouse gas emissions and increase removal of atmospheric carbon dioxide, referred to as carbon sequestration, in the near term.

This CCAP builds on the PCAP by providing insight into the quantitative benefits of the State's current climate reduction strategies and extends the PCAP analysis to include additional measures for climate pollutant mitigation in the near and long-term.

The CCAP also takes advantage of extensive analyses conducted by the NJBPU during development of the State's 2024 Energy Master Plan (NJBPU, 2025). That work included detailed studies of energy and climate emissions based on the E3 Pathways model (Energy and Environmental Economics, 2025) in conjunction with supporting tools such as the PLEXOS electric generation dispatch model (Energy Exemplar, 2025) and USEPA's COBRA health impact assessment model (USEPA, 2025). Extensive stakeholder input was also incorporated into the NJBPU's analysis.

The CCAP assessment relies on three scenarios arising from the NJBPU's work:

- A no-policy scenario, referred to as Business-as-Usual (BAU) assuming that existing laws and rules are rescinded, and no further strategies are implemented. The BAU



Since the publication of the Global Warming Response Act 80x50 Report in 2020, New Jersey's climate priorities have evolved. This 2025 update report continues to identify clean energy, electric vehicles and heat pumps as core tenets, but it also highlights the need to expand energy efficiency, modernize grid infrastructure and pair new clean energy with battery storage systems.

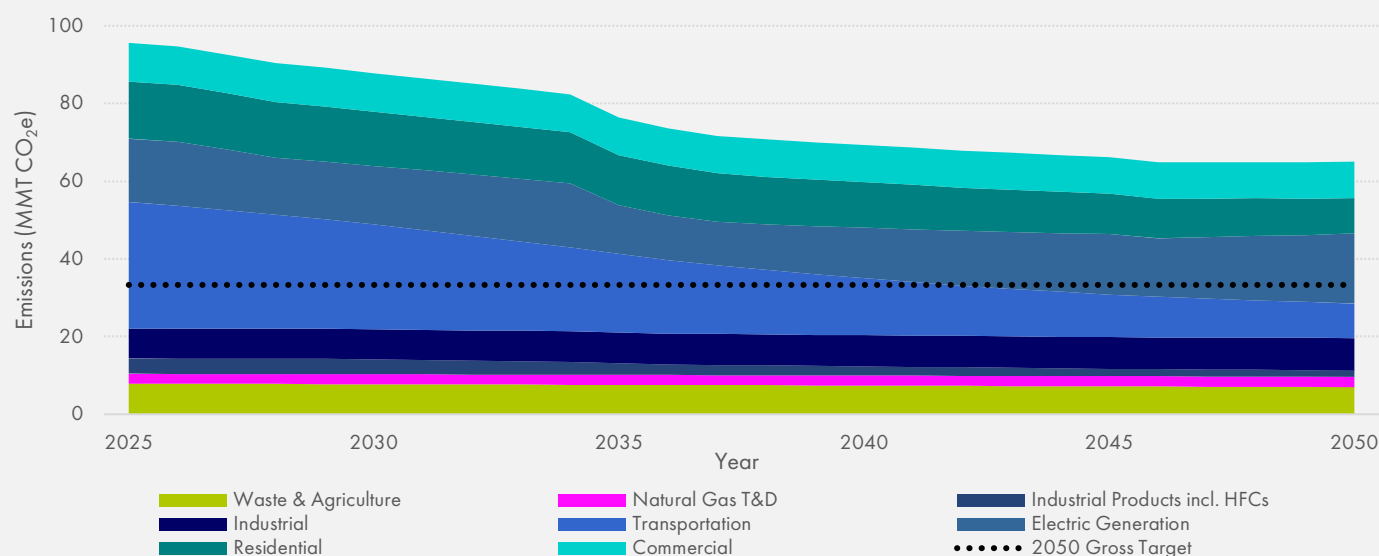
scenario is not intended to represent a real-world condition, but it instead establishes a reference boundary from which the State's progress can be measured.

- A Current Policy Scenario, reflecting the State's present commitments as embodied in statute and rule.
- The CCAP Scenario, based on the 2024 EMP Demand Management Scenario and representing a mix of clean energy investments, transportation improvements, and economy-wide milestones identified by the Pathways and PLEXOS models that will meet the State's climate and energy objectives in an energy-efficient manner.¹

The results of the 2024 EMP modeling study document the benefits of the multiple laws, rules, and programs initiated by the State under Governor Murphy's leadership. If allowed to continue apace, the State is on track to witness a dramatic reduction in climate emissions over the next quarter century. But the study also demonstrates that current policies are not enough to reach the 80% reduction target by 2050 without additional action (Figure ES-1).

Figure ES-1. Gross emissions projected under Current Policies.

Great progress has been made under the administration of Governor Phil Murphy toward meeting the State's emissions reduction goal, as shown by the projection of reductions under current policies shown below, but to actually meet the 80x50 goal it will be necessary to go even further.²



Instead, additional measures are needed, and the CCAP Scenario presents an updated path to meet the 80x50 goal (Figure ES-2). Comparing the Current Policy Scenario with the CCAP Scenario sector-by-sector shows where the greatest additional reductions are required (Figure ES-3). It is clear that existing policies such as the State's adoption of the Advanced Clean Cars II and Advanced Clean Trucks rules will result in near-optimal emissions reductions in the transportation sector, but more progress is necessary in the residential and commercial sectors. Since most energy consumption in the residential and commercial sectors arises from space heating and water heating, and because electrified alternatives such as heat pumps are readily available, the CCAP Scenario identifies installation of many more heat pumps as an essential element of meeting the State's goal. Not surprisingly, the scenario also calls for greater expansion of clean electricity to provide the additional power needed to supply the greater number of electrified devices. Additional measures are proposed to reduce emissions from other sectors including: industry,

¹ The CCAP Scenario is referred to as the Demand Management Scenario in the 2024 EMP. The 2024 EMP also included two additional scenarios in addition to the three referenced in the CCAP: a high-electrification scenario where aggressive decarbonization occurred but efforts to restrain demand growth were not implemented; and a hybrid scenario where limited use of fossil fuels was allowed to continue but the State still made efforts to meet its 80% reduction goal by 2050. The results of those studies highlighted the benefits of addressing demand growth and the difficult compromises that would be necessary if widespread fossil fuel use persisted. The Demand Management scenario was adopted for the CCAP because it represents the most attractive balance of economic, social and environmental needs arising from the 2024 EMP research. The high-electrification scenario and the hybrid scenario are not discussed further in the CCAP.

² Not shown, removal of carbon dioxide from the atmosphere is projected to sequester 9.2 MMT CO₂e by 2050 in the Current Policy scenario, for net emissions of 56.8 MMT CO₂e.

waste, agriculture, highly warming climate pollutants (such as hydrofluorocarbons, and methane from natural gas transmission and distribution) and sequestration from natural carbon sinks.

Figure ES-2. Gross Emissions projected in the CCAP Scenario.

The CCAP Scenario calls for consistent but achievable reductions over a 25-year period. The gross emissions target shown is before accounting for removal of climate pollutants due to natural sequestration processes. Sequestration is projected to remove 9.2 MMT CO₂e annually by 2050.

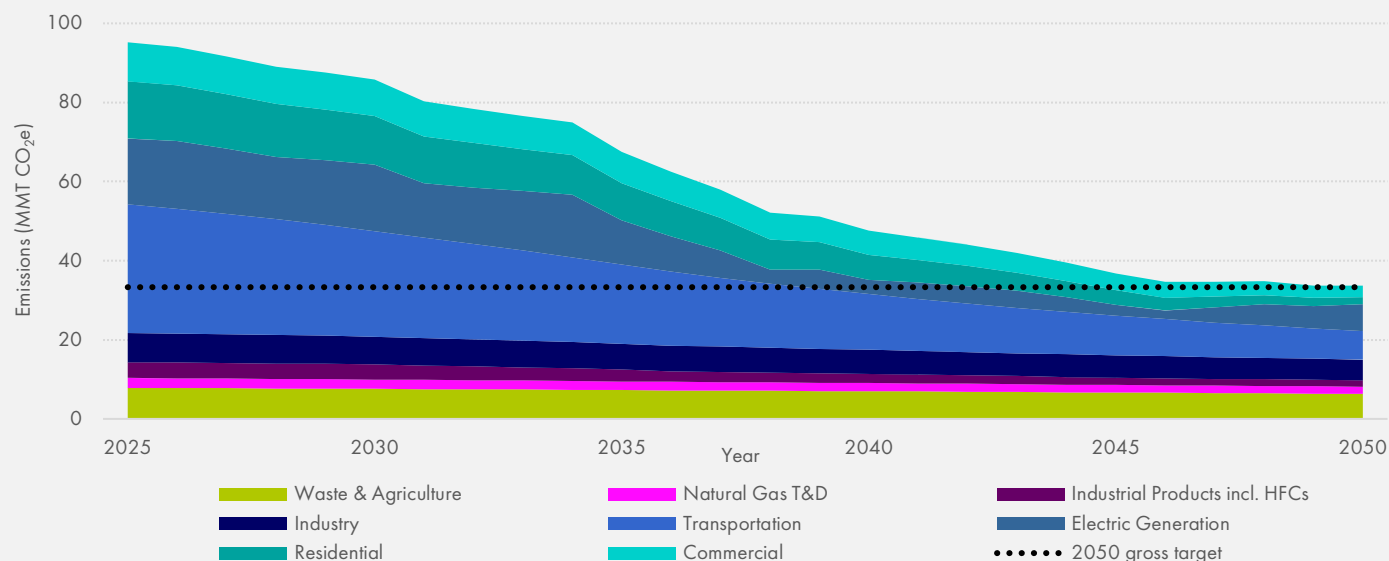
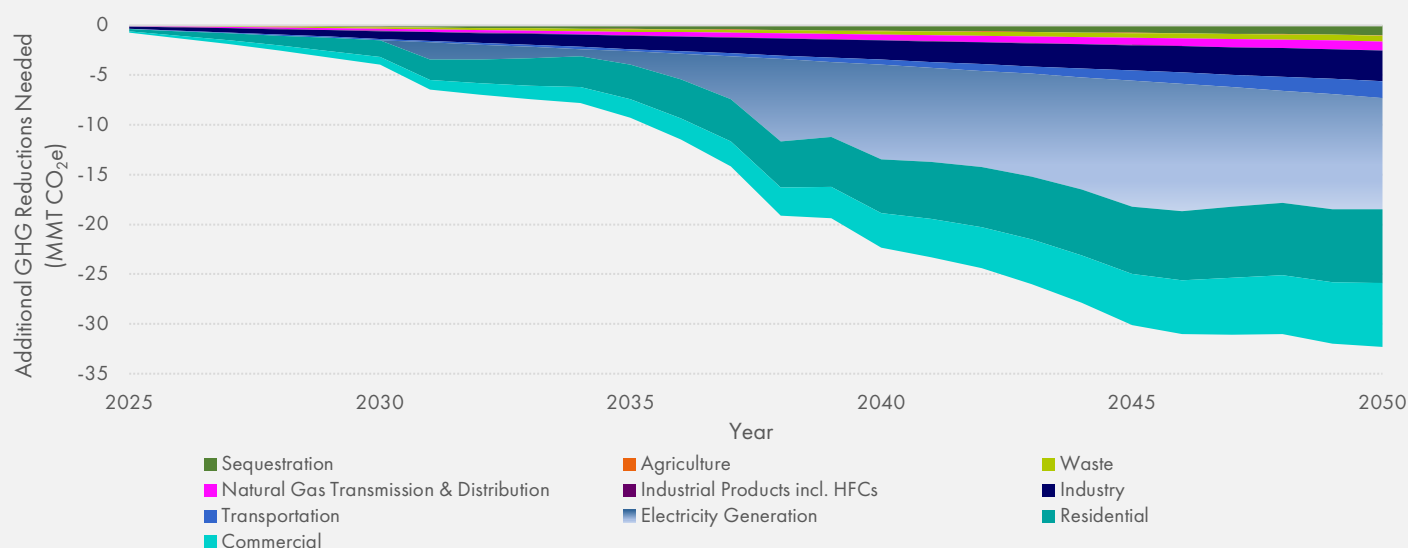


Figure ES-3. Additional emissions reductions needed to meet the 80% reduction goal by 2050, beyond those resulting from current policies, as projected in the CCAP Scenario.

The greatest additional reductions are needed in the residential and commercial sectors, primarily for space heating and water heating, and in the electricity sector, where additional clean energy will be required to supply the greater number of electrified devices.



This CCAP builds on the NJBPU's energy and emissions modeling by specifying tangible measures that will allow the State to realize the milestones identified by modeling. The CCAP measures also go further by considering the energy needs of the State beyond 2050, for example, planning for the eventual replacement of the State's existing nuclear reactors.

Overall, State agencies identified 31 emissions reduction measures within the overall economy (Table ES.1). The measures act in combination such that emissions reductions projected for individual measures acting alone will be influenced by other measures when all are applied together. For example, the proposed update to rules for the State's participation in the Regional Greenhouse Gas Initiative (RGGI) influence the entire sector without specifying in detail what technologies or steps must be taken. This measure is complemented by specific goals, for example installation of a certain amount of utility-scale solar photovoltaic capacity. The first measure provides support for achievement of the second while the second represents an economically optimal balance of resources. In that sense, emissions reductions from individual measures often cannot be added together directly. Modeling, however, can provide insight into the interactions between measures and provide sector-wide projections of emissions benefits.

The measures presented in this CCAP were developed with extensive stakeholder input and intergovernmental collaboration as described in the individual chapters, and they reflect the voices of communities and their leaders. Further, each measure was evaluated for its potential to reduce greenhouse gas emissions and benefit communities (see Communities Benefits Analysis Overview and Appendix D). New Jersey also conducted a workforce planning analysis to understand labor needs for successful implementation (see Workforce Planning Analysis Overview and Appendix E). Further, the plan introduces "Wholistic, Cross-Sector GHG Reduction Approaches" that the State could consider over the next 25 years to accelerate emission reductions from sources in multiple sectors and provide additional co-benefits (see Chapter 8).

Table ES.1. New Jersey's CCAP Comprehensive Measures and Estimated GHG Reductions.

EMISSIONS REDUCTION MEASURES		EST. CUMULATIVE GHG REDUCTION BY 2030 (MMT CO ₂ e)	EST. CUMULATIVE GHG REDUCTION BY 2050 (MMT CO ₂ e)
	TRANSPORTATION		
	01 Continue to implement all current policies and expand current transportation electrification programs	6.7	190.2
	02 Implement a GHG reduction planning standard for State and MPO transportation plans	0.1	0.3
	03 Implement large-scale public transit projects and policies to increase transit ridership	< 0.1	2.7
	04 Explore new pricing mechanisms, and other transportation alternatives that reduce VMT and emissions	53.7	Up to 161
	BUILDINGS		
	01 Accelerate heat pump installations	6.9	152.9
	02 Adopt a Clean Heat Standard	2.6	40.2
	03 Upgrade building envelopes	3.0	38.4
	04 Establish all-electric building codes	3.9	84.7
	05 Adopt statewide Building Performance Standards	Not assessed	Not assessed
	06 Adopt Zero Emissions Standards for space and water heating	0.9	40.2

07	Lead by example by decarbonizing State, county and municipal resources	0.1	2.0
	ELECTRIC GENERATION		
01	Revise RGGI rule to conform with 2025 Program Review Model Rule	1.9	64.4
02	Implement a 100% Clean Electricity Standard	Not assessed independently of other measures	Not assessed independently of other measures
03	Reduce peak demand through adoption of electricity rate designs and policies to support load flexibility	Not assessed independently of other measures	Not assessed independently of other measures
04	Support continued availability of existing resources necessary for the energy transition	Not assessed	Not assessed
05	Support development of an additional 6.2 GW solar photovoltaic capacity	0.3	33.4
06	Continue to support the development of 11GW of offshore wind by 2040	0 to 2.3	272.8
07	Support the development of 2 GW of new nuclear energy generation sources by 2050	0	60.7 Assuming 2040 completion
08	Support deployment of an additional 13.5 GW of energy storage capacity and comprehensive grid improvements	Not assessed independently of other measures	Not assessed independently of other measures
09	Invest in the development of 7 GW of innovative energy technology	0	106.3 Assuming 2045 completion
	INDUSTRY		
1	Adopt manufacturing equipment efficiency standards and incentives for energy efficient technologies	1.0	22.2
2	Implement a mandatory emissions reduction program for high-emitting sources in the industrial sector	1.5	23.6

	WASTE MANAGEMENT AND AGRICULTURE		
1	Adopt stricter rules and incentives for monitoring emissions, landfill caps, and odor controls at landfills and wastewater treatment facilities	1.0 to 5.4	8.0 to 41.5
2	Expand regulatory requirements and incentives for food waste recycling and diversion	0.5 to 1.5	3.4 to 11.5
3	Encourage precision agriculture and utilization of compost on cropland and pasture	0.5	2.7
	HIGHLY WARMING CLIMATE POLLUTANTS		
	Methane from Natural Gas Transmission and Distribution		
1	Implement a mandatory emissions reduction program for natural gas T&D systems	0.7	12.0
2	Stop the expansion of natural gas T&D infrastructure and introduce non-pipeline alternatives	0.8	9.7
	Halogenated Gases		
1	Implement a refrigerant management program	< 0.1	0.8
2	Implement a refrigerant replacement incentive program	< 0.1	0.2
	NATURAL AND WORKING LANDS - CARBON SEQUESTRATION		
1	Strengthen and expand existing natural carbon sinks through reforestation, afforestation, and restoration	0.1	0.7
2	Protect, maintain, and avoid the conversion of natural lands, including 21,000 acres of forested lands, through high-carbon land acquisitions and policies that promote location-efficient development	0	8.1

Note on GHG estimates: Readers are cautioned not to simply add the estimated reductions from each of these sectors to arrive at a total state-wide reduction because the measures interact with one other. For example, to gain the full benefits of electrified transportation and buildings, clean energy must be built in tandem with electrification to avoid reliance on fossil electricity. Timing will determine effectiveness.

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ABBREVIATIONS

>	Greater than	DC	Direct current
≤	Less than or equal to	DEP	New Jersey Department of Environmental Protection
ACC	Advanced Clean Cars	DEP	New Jersey Department of Environmental Protection
ACC II	Advanced Clean Cars II	DER	Distributed energy resource
ACEEE	American Council for an Energy-Efficient Economy	DHS	New Jersey's Department of Human Services
ACES	Alliance for Competitive Energy Services	DOT	Department of Transportation
ACT	Advanced Clean Trucks	DPMC	Division of Property Management and Construction
ADC	Alternative daily cover	DSR	Division of Science and Research
ADI	Administratively Determined Incentive	DVRPC	Delaware Valley Regional Planning Commission
ADU	Accessory dwelling unit	E3	Energy and Environmental Economics
Ag	Agriculture	EAB	Emerald ash borer
AIM	American Innovation and Manufacturing	EDC	Electric distribution company
AIOBC	Adversely impacted overburdened communities	EDECA	Electric Discount and Energy Competition Act
APTA	American Public Transportation Association	EGU	Electric generating unit
ASHPs	Air source heat pump	EITE	Energy intensive and trade-exposed industries
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers	EJ	Environmental Justice
BAU	Business-as-Usual scenario	EJAC	Environmental Justice Advisory Committee
BEV	Battery electric vehicles	EMP	New Jersey Energy Master Plan
BILT	Business and Industry Leadership Team	EO	Executive order
BPS	Building performance standards	EPR	Extended producer responsibility
BRT	Bus rapid transit	EPs	Environmental product declarations
CARB	California Air Resource Board	EQIP	Environmental Quality Incentives Program
CBECS	Commercial Buildings Energy Consumption Survey	EV	Electric vehicle
CBEI	Consumption-Based Emissions Inventory	EY	Energy year
CCAP	Comprehensive Climate Action Plan	FCEV	Fuel cell electric vehicles
CCNG	Combined cycle natural gas	FERC	Federal Energy Regulatory Commission
CCRC	Climate Change Resource Center	FFA	New Jersey Future Farmers of America
CCSP	Conservation Cost Share Program	F-gas	Fluorinated gas
CEA	Clean Energy Act	FHWA	Federal Highway Administration
CERAP	Coastal Ecological Restoration and Adaptation Plan	FIA	Forest Inventory and Analysis
CES	Clean Electricity Standard	ForCARMA	Forest Carbon and Risk Modeling Assessment
CESA	Clean Energy States Alliance	FRIP	Fluorinated gas, or F-gas, Reduction Incentive Program
CFC	Chlorofluorocarbons	FY	Fiscal year
CFR	Code of Federal Regulations	GCCS	Gas collection and control systems
CH ₄	Methane, aka Natural Gas	GCL	Glassboro-Camden Line
CHANJ	Connecting Habitat Across New Jersey	GEMM	Greenhouse Gas Emissions and Energy Management for Manufacturing rule
CIG	Conservation Innovation Grant	GHG	Greenhouse gas
CNG	Compressed natural gas	GHGMRR	Greenhouse Gas Monitoring and Reporting Rule
CO ₂	Carbon dioxide	GIS	Geographic information System
CO ₂ e	Carbon dioxide equivalent	GSESP	Garden State Energy Storage Program
C-PACE	Commercial Property Accessed Clean Energy	GSHp	Ground source heat pump
CPRG	Climate Pollution Reduction Grant	GW	Gigawatt
CREP	Conservation Reserve Enhancement Program	GWP	Global Warming Potential
CSEP	Community Solar Energy Program	GWP100	100-year global warming potential
CSI	Competitive Solar Incentive		
CSP	Conservation Stewardship Program		

GWP20	20-year global warming potential	NEWMOA	Northeast Waste Management Officials Association
GWRA	Global Warming Response Act	NF3	Nitrogen trifluoride
HBLR	Hudson-Bergen Light Rail	NGO	Non-governmental organization
HCFC	Hydrochlorofluorocarbons	NJ	New Jersey
HFC	Hydrofluorocarbons	NJ PACT	New Jersey Protecting Against Climate Threats initiative
HFO	Hydrofluoroolefins	NJ TRANSIT	New Jersey TRANSIT
HVAC	Heating, ventilation and air conditioning	NJBPU	New Jersey Board of Public Utilities
HWCP	Highly Warming Climate Pollutants	NJCEP	New Jersey Clean Energy Program
ICC	International Code Council	NJDA	New Jersey Department of Agriculture
IECC	International Energy Conservation Code	NJDCA	New Jersey Department of Community Affairs
IHP	Industrial heat pumps	NJDEP	New Jersey Department of Environmental Protection
IPCC	Intergovernmental Panel on Climate Change	NJDOL&WD	New Jersey Department of Labor & Workforce Development
IPPU	Industrial Processes and Product Use	NJEDA	New Jersey Economic Development Authority
ISG	Industrial Stakeholder Group	NJEJA	New Jersey Environmental Justice Alliance
ITS	Intelligent Transportation System	NJHA	New Jersey Highway Authority
kW	Kilowatt	NJMVC	NJ Motor Vehicle Commission
LAUF	Lost and unaccounted for gas	NJPEEC	New Jersey Progressive Equitable Energy Coalition
LBE	Lead by example	NJRC&D	North Jersey Resource Conservation and Development Program
LDC	Local distribution company	NJT	New Jersey TRANSIT
LDD	<i>Lymantria dispar dispar</i> moth, aka gypsy moth	NJTA	New Jersey Turnpike Authority
LDEV	Light duty electric vehicles	NJTPA	North Jersey Transportation Planning Authority
LDV	Light duty vehicles	NJUFCF	Urban and Community Forest Program
LECC	Lower-embodied-carbon concrete	NOAA	National Oceanic and Atmospheric Administration
LFG	Landfill gas	NOx	Nitrous oxides
LGEA	Local government energy audit	NPA	Non-pipeline alternatives
LIDAC	Low-Income and Disadvantaged Community	NRCS	Natural Resource Conservation Service
LMI	Low and moderate income	NWL	Natural and Working Lands
LMP	Locational marginal pricing	NWLS	Strategy to Advance Carbon Sequestration on New Jersey's Natural and Working Lands
LRT	Light rail transit, or light rail	NYC	New York City
MBUF	Mileage-Based User Fee	NYISO	New York Independent System Operator
MMBtu/hour	Million Btus an hour	O&M	Operations and maintenance
MMT	Million metric tons	OBC	Overburdened community
MOVES	MOtor Vehicle Emission Simulator	OC	Organic carbon
MPO	Metropolitan planning organization	ODS	Ozone depleting substances
MSA	Metropolitan statistical area	OFSA	Office of the Food Security Advocate
MSF	Mode-shift factor	OREC	Offshore wind renewable energy certificate
MSW	Municipal solid waste	OSW	Offshore wind
MT	Metric tons	OWEDA	Offshore Wind Economic Development Act
MTA	Metropolitan Transportation Authority	P.L.	Public law
MTCO₂e	Metric tons CO ₂ e	PANYNJ	Port Authority of New York and New Jersey
MVP	Manufacturing Voucher Program	PCAP	Preliminary Climate Action Plan
MW	Megawatt	PCO	Parking cash-out
MWh	Megawatt hour	PFC	Perfluorocarbons
N.J.A.C.	New Jersey Administrative Code	PHEV	Plug-in hybrid electric vehicles
N₂O	Nitrous oxide	PJM	PJM Interconnection, L.L.C. regional grid operator
NAAC	Native American Advancement Corporation	PM	Particulate matter
NAAQS	National Ambient Air Quality Standard		
NAICS	North American Industrial Classification System		
NCS	Natural Climate Solutions		
NEMS	United States Energy Agency National Energy Modeling System		
NESCAUM	Northeast States for Coordinated Air Use Management		

PM2.5	Particulate matter of 2.5 microns or smaller
PMR	Pipeline Modernization Report
PPA	Power purchase agreement
ppm	Parts per million
ppmv	Parts per million by volume
PV	Photovoltaic
RDI	Relative Density Index
REA	Recycling Enhancement Act grants
REAL	Resilient Environments and Landscapes
REC	Renewable energy credit
RECS	Residential Energy Consumption Survey
RETROFIT NJ	Reducing Emissions through Retrofits, Optimization, Fuel-switching, and Innovative Technologies Grant Program
RGGI	Regional Greenhouse Gas Initiative
RMP	Refrigerant Management Program
RNG	Renewable natural gas
RNM	Remote Net Metering
RPS	Renewable Portfolio Standard
SAA	State Agreement Approach
SADC	State Agriculture Development Committee
SAV	submerged aquatic vegetation
SBC	Societal Benefit Charge
SEDS	State Energy Data System
SF6	Sulfur hexafluoride
SJTA	South Jersey Transportation Authority
SJTPO	South Jersey Transportation Planning Organization
SLCP	Short-lived climate pollutant
SMR	Small modular reactors
SNAP	Significant New Alternatives Policy
SOx	Sulfur oxides
SPARKS	Spurring Projects to Advance Energy Research and Knowledge Swiftly
SPB	Southern pine beetle
SREC	Solar Renewable Energy Credit
STEM	Science, technology, engineering and mathematics
SuSI	Successor solar incentive
SUV	Sport utility vehicles
SWIFR	Solid Waste Infrastructure for Recycling Grants
T&D	Transmission and distribution
tCO2e	Tons of carbon dioxide equivalent
TDM	Transportation demand management
TDR	Transfer of development rights
TEN	Thermal energy networks
TOD	Transit oriented development
TWh	Terawatt hour
UCC	Uniform Construction Code
US DOE	United States Department of Energy
USCA	United States Climate Alliance
USDA	United States Department of Agriculture
USDOE	United States Department of Energy
USEIA	United States Energy Information Agency
USEPA	United States Environmental Protection Agency
USFS	United States Forest Service

V2B	Vehicle-to-Building
V2G	vehicle-to-grid
V2S	Vehicle-to-storage
V2X	Vehicle-to-everything
VGI	vehicle-grid infrastructure
VMT	Vehicle miles travelled
VOC	Volatile organic compounds
WWT	Wastewater treatment
WWTF	Wastewater treatment facilities
yr	Year
ZEV	Zero emission vehicle



INTRODUCTION

BACKGROUND

The Challenge Ahead

Climate change poses the single greatest threat to the well-being of the environment, the success of the economy and the health and safety of communities in New Jersey and the rest of the world. Globally, the past 11 years (2015-2025) are set to be the warmest on record (WMO, 2025). As a coastal and densely populated state, New Jersey faces especially severe and life-threatening challenges from climate change including sea-level rise, intensifying storms and flooding, shifting weather patterns, wildfires, and extreme heat. From 2013-2022, about 10,000 New Jerseyans visited emergency departments for heat-related illness (NJDEP, 2020). Between 1958 and 2016, in the northeastern United States, where New Jersey is located, the most extreme daily precipitation events, or the top 1% of all storms, increased in amounts by 55% (NJDEP, 2020). According to the New Jersey Scientific Report on Climate Change Science Report (NJDEP, 2020), by 2050:

- Heatwaves will become more frequent, last longer, and impact larger areas.
- There is a 50% chance sea levels will rise at least 1.4 feet and a 17% chance they will exceed 2.1 feet, with those numbers climbing to 3.3 to 5.1 feet by the end of the century under a moderate emissions scenario.
- Annual precipitation in the State is expected to increase from 6% to 9% by 2100.
- If carbon dioxide (CO₂) emissions continue at current rates, ocean pH levels by the end of the century are expected to drop to levels that would make the ocean more acidic than has been seen for the past 20 million years (Ocean Portal Team, 2018).

These scenarios will be exacerbated by inaction. Scientific research confirms that human activities are driving these changes (NJDEP, 2020), and minimizing these risks requires immediate, decisive, and sustained commitments from all levels of government to ensure a steep reduction of greenhouse gas (GHG) emissions across all major sectors. GHGs contributing to climate change primarily come from burning fossil fuels, such as oil and natural gas, as well as industrial emissions, including methane and refrigerants. Without swift and decisive action, New Jersey, in combination with other states and regions will face a future of extreme heat, worsening floods, and irreversible damage to its vibrant natural landscapes, human health and wellbeing, and the prosperity of its people. The most recent UN climate report amplifies the urgency for swifter and larger actions by governments to reduce GHG emissions. The report issued in early November finds that global temperatures will likely exceed 1.5°C above pre-industrial levels (the target set in the global 2015 Paris Agreement) within the *next decade*, and that global GHG emissions would need be reduced by about 55% by 2035 to achieve the Paris Agreement 1.5°C target (UNEP, 2025). Even limiting global warming to 2.0°C by 2100 would require a roughly 35% reduction in GHG emissions in the next decade. The UN Report states that current national commitments, if fully implemented, would cut emissions only 12 to 15% by 2035 (UNEP, 2025) — leaving the world well off target and highlighting the dire circumstances of the current global effort to address the climate crisis. Every fraction of a degree of warming the world can avoid means climate change and its impacts will be less severe. Therefore, states like New Jersey must continue to lead and work in collaboration with other states and regions to pursue bold actions that will reduce GHG emissions.

New Jersey's Climate Leadership

To meet the urgency of the climate crisis, New Jersey has already taken significant action toward reducing GHG emissions. Governor Murphy's Executive Order 274 (EO 274) set an interim target to cut emissions by 50% by 2030, building on the State's long-term goal of an 80% reduction by 2050, mandated by the Global Warming Response Act (P.L. 2007, c. 112 (C.26:2C-37 et al.)). Achieving these ambitious targets will require substantial near-term investments, sweeping policy reforms, accelerated clean energy development, and strong economy-wide support to drive lasting change.

The State has released a series of reports, establishing a clear and comprehensive path towards reducing GHG emissions. In the State's Global Warming Response Act 80x50 Report, released in 2020, New Jersey outlines strategies to achieve its long-term emissions reduction goal. The report identifies the following key sectors as the primary sources of GHG emissions: transportation, residential and commercial buildings, electricity generation, industry, short-lived climate pollutants, waste and agriculture, and carbon sequestration. It also outlines pathways for substantial decarbonization. Some of these pathways include transitioning to zero-emission vehicles, electrifying heating and cooling systems, expanding renewable energy, reducing food waste, improving industrial efficiency, and enhancing carbon sequestration through better land management. While New Jersey has made progress, particularly in transitioning away from coal as a source of electric power, current policies and projects alone are insufficient to meet the required emissions reduction targets from baseline levels, collected in 2006. This Comprehensive Climate Action Plan (CCAP) builds on New Jersey's 2024 Energy Master Plan (2024 EMP), the Global Warming Response Act 80x50 report, and the State's Priority Climate Action Plan (PCAP), advancing the measures and enabling actions that will accelerate progress, close the emissions gap, and help New Jersey thrive as it leads the way in addressing climate change.

Overview of the Climate Pollution Reduction Grant Program

The Climate Pollution Reduction Grant (CPRG) program is funded by the Inflation Reduction Act (P.L. 117-169). Phase 1 provided \$250 million in noncompetitive planning grants to states, local governments, tribes, and territories to develop and implement climate action plans for reducing GHG emissions and other harmful air pollution. Phase 2 of the CPRG program allocated \$4.6 billion in competitive funding to implement priority GHG reduction measures, including a \$248.9 million grant award for The Clean Corridor Coalition, a multi-state effort between New Jersey, Connecticut, Delaware, and Maryland, to deploy medium- and heavy-duty vehicle charging infrastructure along the I-95 corridor.

This CCAP meets the requirements of the United States Environmental Protection Agency's (USEPA) Climate Pollution Reduction Grant program "Phase 1" planning grant awarded to New Jersey in 2023. The CCAP is the second of three deliverables that the State is required to submit to USEPA under the CPRG planning grant. New Jersey submitted its first deliverable, the PCAP, in March 2024.¹ The PCAP built upon the goals, strategies, and actions of the 2019 Energy Master Plan and the 2020 Global Warming Response Act 80x50 Report, but it was not intended to be comprehensive, and it focused on short-term priorities for reducing major GHG emission sources by 2030. New Jersey developed this CCAP to identify long-term comprehensive GHG reduction measures and actions the state could prioritize to achieve its climate goal of an 80% reduction in GHG emissions from 2006 levels by 2050.

Purpose of the Comprehensive Climate Action Plan (CCAP)

This CCAP identifies ways to close the gap between emissions strategies outlined in the preceding PCAP and Global Warming Response Act 80x50 Report and the State's long-term GHG reduction goals. This comprehensive plan provides both a refresh of existing plans and an outline of new strategies that could be prioritized to reduce emissions between now and 2050. It is based on the Demand Management Scenario modeling conducted for the 2024 EMP which focuses on reducing overall energy consumption and managing peak demand, particularly through energy efficiency and conservation, while significantly increasing clean energy generation. The CCAP goes a step further than the 2024 EMP by outlining the specific actions across all emission sectors New Jersey could take to meet its climate goals for 2050. The GHG reduction measures outlined in this plan have been identified to protect New Jersey's residents and the environment from the most severe impacts of climate change, with input from the State's overburdened communities who experience the devastating impacts of climate change at disproportionate rates.

Meaningful engagement with the State's environmental justice communities and low-income and disadvantaged communities was foundational in developing this CCAP and is a requirement of the grant funding. NJDEP actively engaged with these communities through outreach efforts described in the Community Engagement section below (and Appendix B), ensuring their priorities are reflected in the final plan. This engagement also informs the Benefit Analysis

¹ See [New Jersey's Priority Climate Action Plan](#).

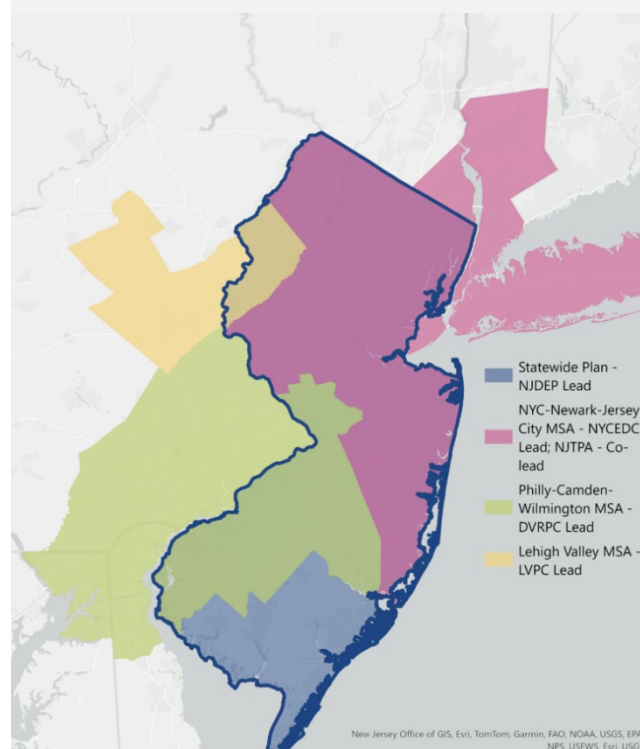
and Workforce Planning Analysis included in this plan. These analyses meet USEPA requirements and ensure that the plan not only focuses on reducing emissions but also on producing co-benefits such as the reduction of criteria and hazardous air “co-pollutants,” in communities, and the expansion of economic and workforce development opportunities in the green economy, by providing cutting-edge training and good-paying jobs to New Jersey residents.

INTERAGENCY AND INTERGOVERNMENTAL COORDINATION

Interstate Coordination

Three census outlined metropolitan statistical areas (MSAs) were required to submit CPRG plans that cover a portion of New Jersey. The New York City MSA spanning New York and New Jersey, the Lehigh Valley MSA spanning Pennsylvania and New Jersey, and the Philadelphia MSA spanning Pennsylvania, New Jersey, Delaware, and Maryland. The interstate nature of New Jersey’s economy necessitates an interstate approach to emissions reductions. To facilitate this, NJDEP staff participated in the United States Climate Alliance’s interstate CPRG planning calls and USEPA’s Technical Assistance Forums, which helped ensure alignment with broader state-level climate initiatives. NJDEP also participated in the Delaware Valley Regional Planning Commission’s sector-specific interagency working groups to ensure regional alignment of priorities.

Figure I-1. CPRG Workplan Areas within New Jersey.



Intrastate Coordination

NJDEP utilized the opportunity presented by the CPRG to ensure that a whole-of-government approach was taken in developing reductions in GHG emissions by initiating ongoing dialogues with other State departments and agencies. These meetings helped coordinate best practices while also aligning policies and programs across state agencies. In total, NJDEP attended, hosted, or supported over 40 meetings with other state departments and agencies, including key partners such as the New Jersey Economic Development Authority, the Department of Community Affairs, the Department of Transportation, the Department of Agriculture, Department of Labor and NJ TRANSIT.

A key pillar of this interagency coordination was maintaining close coordination between the public engagement efforts for the CCAP and the 2024 EMP, an initiative of the New Jersey Board of Public Utilities (NJBPU). NJDEP staff worked closely with NJBPU and their contractors to align the EMP modeling with the CCAP deliverables. This modeling served as the foundational data for the CCAP’s measures and implementation strategies. NJDEP attended all NJBPU’s engagement sessions on the EMP, including four public hearings held in the summer of 2024, five small-group stakeholder workshops, and one public input session in the spring of 2025. Notice of these forums was cross posted to the CCAP listservs to boost awareness. This comprehensive cross-agency involvement ensured alignment between the messaging presented in the CCAP and the 2024 EMP, allowing both agencies to benefit from the learnings of these efforts without creating undue stakeholder fatigue.

NJDEP staff additionally participated in ongoing formal interagency meetings throughout the CCAP development—including the Buildings Working Group, the Energy Code Working Group, and the Partnership to Plug-in initiative—as well as informal coordination meetings—including those with NJ TRANSIT and the Department of Agriculture and the NJDEP Division of Sustainable Waste Management. As measures were developed, they were also shared with relevant

state agencies for review to ensure the measures were in alignment with their agency directives and authorities to implement.

Local Government Coordination

Many of the actions proposed in the CCAP require action by the State’s local governments. NJDEP hosted in-person and virtual community stakeholder listening sessions in the spring and summer of 2025 that focused on the climate-related priorities of the State’s overburdened communities and were open to all, including local government officials and those engaged in climate emission reduction efforts at the local level. Continuing to understand both local and State agency feedback will be paramount in the implementation of CCAP measures.

COMMUNITY ENGAGEMENT OVERVIEW

In preparing the CCAP, states were required to design strategies that not only reduce GHG emissions but also deliver broad community benefits. As part of this effort, grant recipients are required to assess how their proposed climate actions will improve air quality, public health, economic opportunity, environmental quality, and climate resilience. These co-benefits are considered essential to building an equitable and effective climate response.

To meet these goals, NJDEP prioritized inclusive, community-driven engagement. Building on the stakeholder outreach conducted during the PCAP phase, NJDEP centered public voices—especially those from Overburdened Communities (OBCs)—through a robust and values-based approach. The result is a climate plan that reflects community priorities, delivers measurable benefits, and uplifts those most affected by climate pollution and climate risks.

Engagement Framework and Principles

NJDEP’s engagement was guided by a values-based framework outlined in a community engagement plan (NJDEP, 2024), which emphasized accessibility, accountability, and respect. These principles—drawn from the USEPA’s community engagement guidance (USEPA, 2024)—shaped how the Department engaged with residents and stakeholders across the State. Engagement efforts were accessible, with plain language materials, and logistical support for local event hosting. They were informative, offering participants the background knowledge necessary to engage meaningfully in climate discussions. NJDEP developed a series of educational handouts about climate change, emissions sources, previous community input, and key terminology. The process was interactive, with space for open dialogue and NJDEP in a listening role. Engagement remained continuous, building on previous conversations and maintaining consistent outreach throughout the planning process. Most importantly, it was accountable—community feedback was directly integrated into relevant sections of the plan, including where possible into the GHG reduction measures and enabling actions themselves. The CCAP public engagement process unfolded in five phases:

Figure 1-2. CCAP Public Engagement Process.

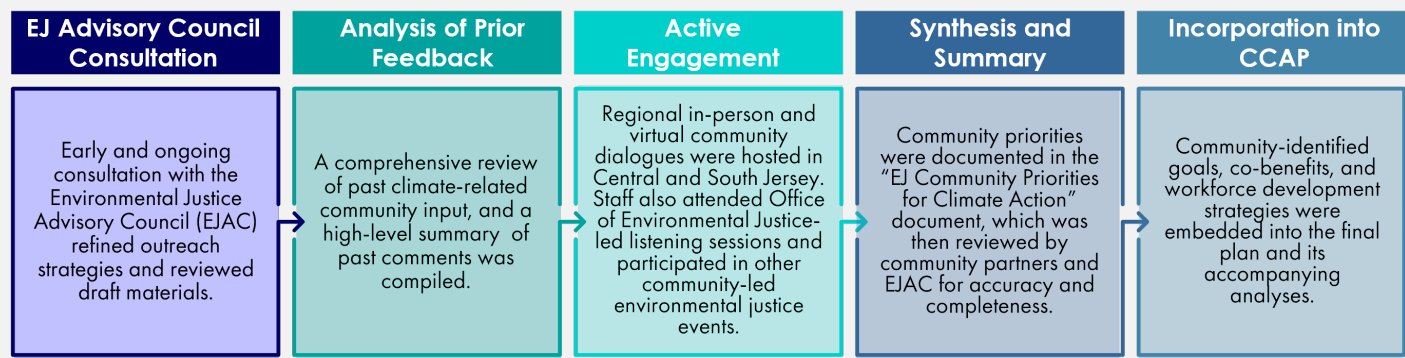




Figure I-3. Photos from the Climate Action Community Dialogue NJDEP cohosted in New Brunswick, NJ with the Metuchen Edison and Piscataway Branch of the NAACP and the Southern Burlington County NAACP.

CPRG Community Engagement Sessions:

NJDEP co-hosted a series of in-person and virtual community dialogues particularly focused on residents and members of community organizations in New Jersey's OBCs.

- North Jersey / Newark Climate Action Community Dialogue, December 2023
- Central Jersey / New Brunswick Climate Action Community Dialogue, April 2025
- South and Central Jersey Climate Action Virtual Community Listening Sessions, June 2025

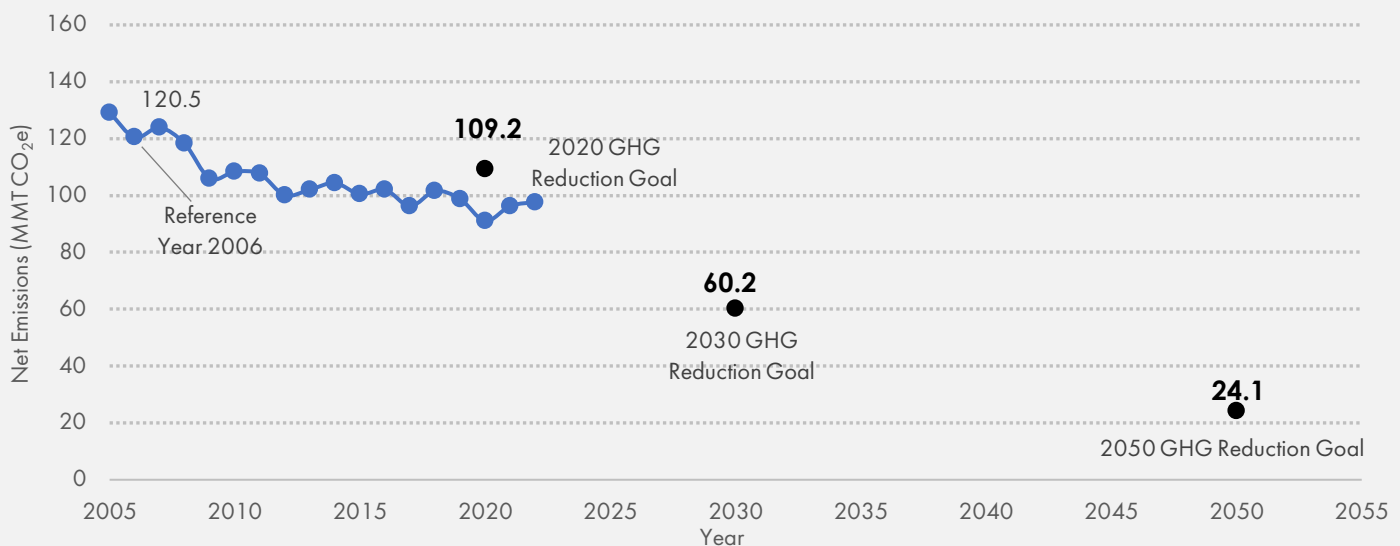
This feedback informed much of the plan and allowed for follow-up and continued conversions from prior community engagement. Feedback, major takeaways, and themes from these community engagement sessions and how they were considered in the final CCAP are discussed in detail in Appendix B.

GREENHOUSE GAS INVENTORY OVERVIEW

The New Jersey Global Warming Response Act (GWRA, P.L. 2007, c.112, as amended 2019) calls for an annual compilation of statewide GHG emissions data. Periodic inventory updates provide vital information for assessing the State's progress towards meeting its GHG reduction goals (Figure I-4). Specifically, the GWRA calls for the State, no later than January 1, 2020, to reduce GHG emissions to, or below, the level of emissions in 1990. Based on the assessment presented here, the State achieved that goal more than a decade early. The GWRA also requires the State to reduce its statewide GHG emissions to at least 80% below 2006 levels by January 1, 2050. More recently, Governor Phil Murphy's Executive Order 274 established an interim target of reducing total GHG emissions to 50% of 2006 levels by 2030.

Figure I-4. New Jersey Emissions and Greenhouse Gas Reduction Goals.

The State has made progress, but must reduce GHG emissions more quickly in order to achieve the 2050 objective.



Inventory Structure and Process

New Jersey uses an inventory scope and framework consistent with international and national GHG inventory practices. This inventory provides estimates of anthropogenic GHG emissions within New Jersey, and those associated with imported electricity and exported waste. Biogenic (natural) sources are not included in the inventory. The inventory includes estimates for:

- Carbon Dioxide (CO₂);
- Methane (CH₄);
- Nitrous Oxide (N₂O);
- Fluorinated gases with high global warming potentials (GWP) which includes hydrofluorocarbons (HFCs) and sulfur hexafluoride (SF₆);
- black carbon; and
- Estimates of Carbon Sequestration from natural and working lands.

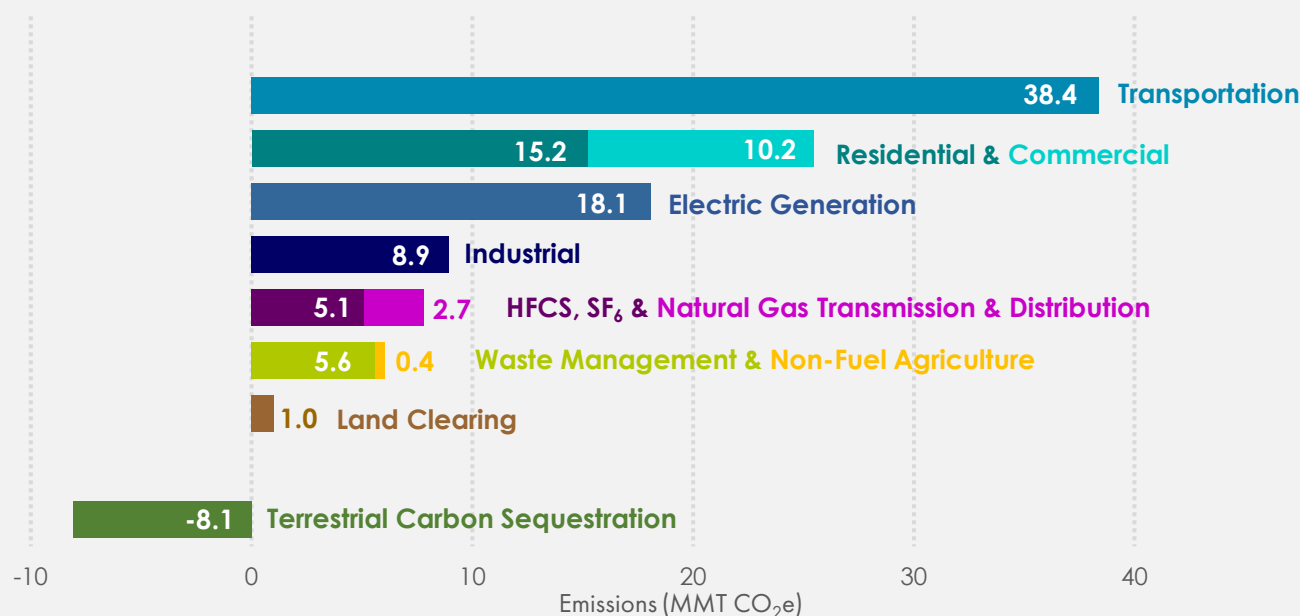
Emission estimates are recalculated annually for all years to maintain a consistent time-series following the Intergovernmental Panel on Climate Change recommendations for developing GHG inventories. Thus, emissions levels

in this report may differ from those in previous inventory editions. The full GHG Inventory report and the methods applied is available online.²

2022 Greenhouse Gas Emissions

In 2022, statewide gross emissions were 105.7 million metrics tons (MMT) of carbon dioxide equivalent (CO₂e) 100-year GWP (GWP₁₀₀) (Figure 2.2), or 128.8 MMT CO₂e 20-year GWP (GWP₂₀). Energy consuming sectors were the largest sources of emissions, totaling 86% of the gross total, and originated from fossil fuel combustion from transportation, electric generation, residential and commercial activities, and fuel-consuming industrial activities. Non-energy emissions accounted for the remaining 14% of emissions and are associated with a variety of processes such as fugitive releases of halogenated gases and sulfur hexafluoride; methane from natural gas transmission and distribution; methane and nitrous oxide from waste management and agriculture; and carbon dioxide from industrial process chemistry. Approximately 8% of 2022 emissions were removed via carbon sequestration from New Jersey's natural and working lands, such as forests and wetlands, resulting in a net emission total of 97.6 MMT CO₂e.

Figure I-5. New Jersey 2022 GHG Emissions (GWP₁₀₀).



Between 2006, the State's reference year, and 2022, New Jersey's net emissions dropped from 120.5 MMT CO₂e to 97.6 MMT CO₂e, or by 19%. Looking across the sixteen-year period, many reductions can be traced to the adoption of new technologies with inherent environmental benefits. For example, aging coal-fired power plants in New Jersey have been entirely phased out. In their place are new, less-polluting combined-cycle natural gas systems and a burgeoning supply of renewable energy. Similarly, improvements in the fuel efficiency of passenger vehicles and home heating systems have contributed to overall emission reductions. However, many of these improvements have been offset by countervailing social forces, for example the preference for larger motor vehicles, more frequent travel, and spacious homes. Later in this plan, (See the Structure of the CCAP Sector Chapters section) the emissions activities considered within each sector of the GHG inventory are described in manageable terms.

² <https://dep.nj.gov/wp-content/uploads/ghg/ghg-inventory-mcu-2025-1.pdf>

PROJECTIONS & TARGETS

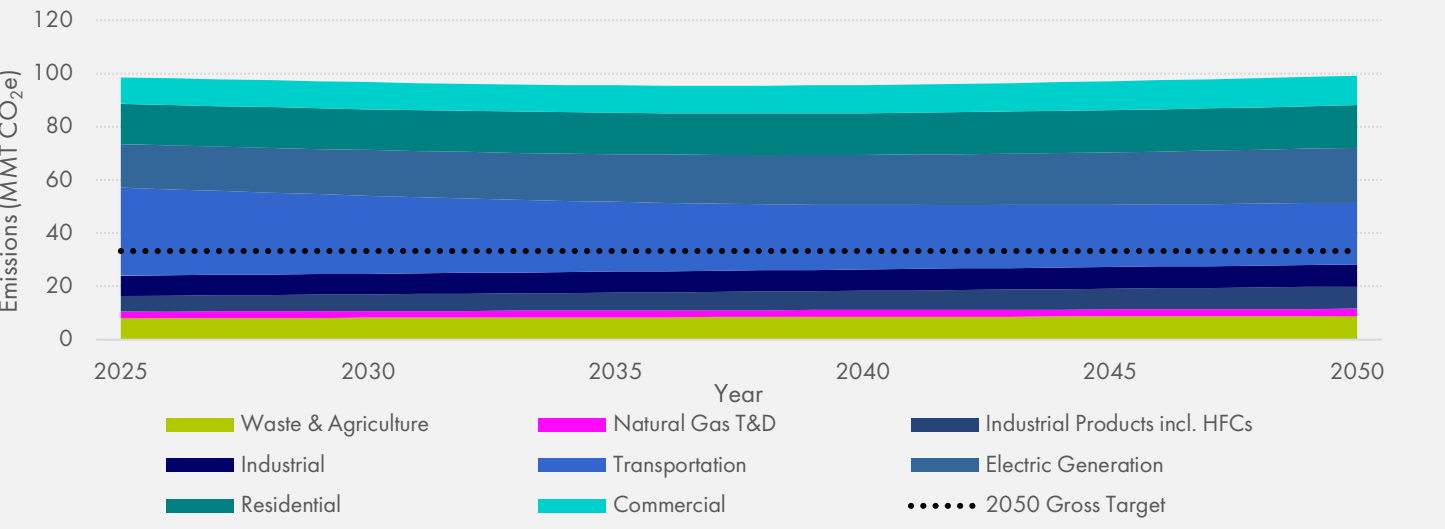
Greenhouse Gas Projections

The CCAP takes advantage of extensive analysis conducted by the NJBPU during development of the State’s 2024 EMP (NJBPU, 2025). That work included detailed studies of energy and climate emissions based on the E3 Pathways model (Energy and Environmental Economics, 2025) in conjunction with supporting tools such as the PLEXOS electric generation dispatch model (Energy Exemplar, 2025) and USEPA’s COBRA health impact assessment model (USEPA, 2025).³ Extensive stakeholder input was also incorporated into the NJBPU’s analysis.

The CCAP assessment relies on three scenarios arising from the NJBPU’s work:

- A no-policy scenario, referred to as Business-as-Usual (BAU), assuming that existing rules and laws are rescinded and no further strategies are implemented. For example, when cars are replaced, the new vehicles always have the properties of models from the early 2020s. The BAU Scenario is not intended to represent a real-world condition but instead establishes a reference boundary from which the State’s progress can be measured. The BAU Scenario projection is shown in Figure I-6.
- A Current Policy Scenario, reflecting the State’s present commitments as embodied in statute and rule.
- The CCAP Scenario, based on the 2024 EMP Demand Management Scenario and representing a mix of clean energy investments, transportation improvements, and economy-wide milestones identified by the Pathways and PLEXOS models that will meet the State’s climate and energy objectives in an energy-efficient manner.⁴

Figure I-6. Gross emissions projected under BAU Scenario, reference case.
The business-as-usual (BAU) represents a no-policy scenario. The BAU Scenario is not intended to represent a real-world condition, but instead establishes a reference boundary from which the State’s progress can be measured.



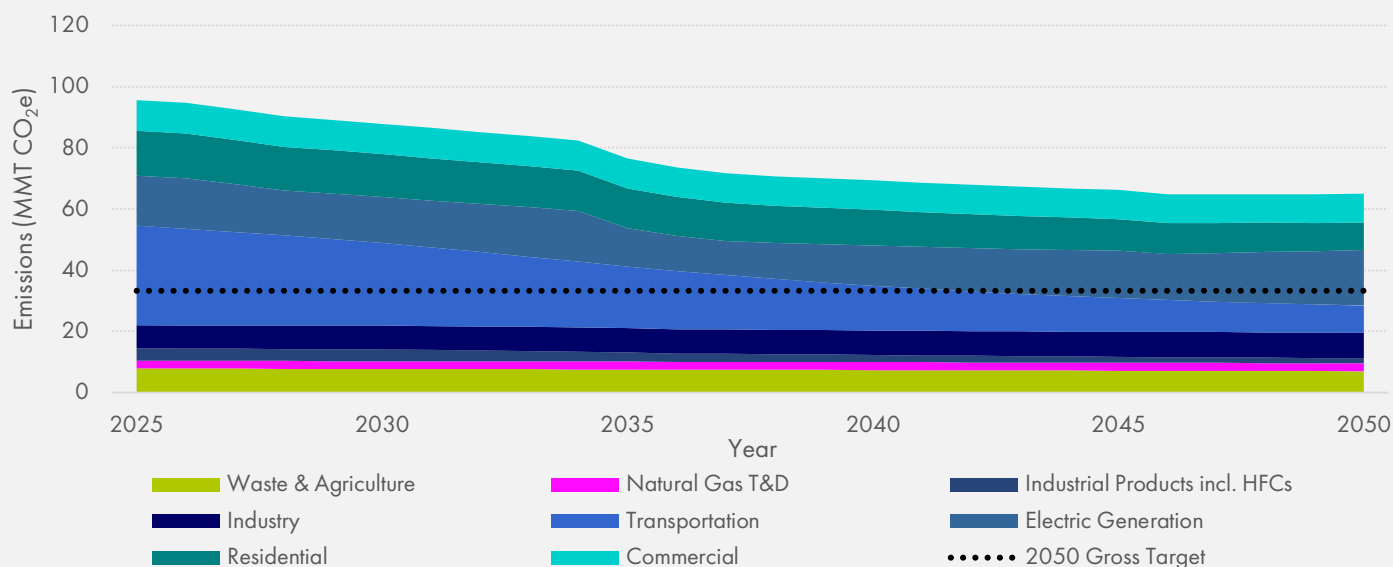
³ Details on the methods used for emissions and energy modeling can be found in the 2024 EMP (NJBPU, 2025). Projections in the CCAP are based on the latest New Jersey GHG inventory data (2021 data year) available at the time the modeling was conducted for the 2024 NJ EMP.

⁴ The CCAP Scenario is referred to as the Demand Management Scenario in the 2024 EMP. The 2024 EMP also included two additional scenarios in addition to the three referenced in the CCAP: a high-electrification scenario where aggressive decarbonization occurred but efforts to restrain demand growth were not implemented; and a hybrid scenario where limited use of fossil fuels was allowed to continue but the State still made efforts to meet its 80% reduction goal by 2050. The results of those studies highlighted the benefits of addressing demand growth and the difficult compromises that would be necessary if widespread fossil fuel use persisted. The Demand Management Scenario was adopted for the CCAP because it represents the most attractive balance of economic, social and environmental needs arising from the 2024 EMP research. The high-electrification scenario and the hybrid scenario are not discussed further in the CCAP.

The results of the 2024 EMP modeling study document the benefits of the multiple laws, rules, and programs initiated by the State under Governor Murphy's leadership. If continued apace, the State is on track to witness a dramatic reduction in climate emissions over the next quarter century. But the study also demonstrates that current policies are not enough to reach the 80% reduction target by 2050 without additional action (Figure I-7).

Figure I-7. Gross emissions projected under Current Policy Scenario.

Great progress has been made under the administration of Governor Phil Murphy toward meeting the State's emissions reduction goal, as shown by the projection of reductions under current policies shown below, but to actually meet the 80x50 goal it will be necessary to go even further.⁵



Comparing the Current Policy Scenario (Figure I-7) with the CCAP scenario (Figure I-8), sector-by-sector highlights where the greatest additional reductions are required (Figure I-9). It is clear that existing policies such as the State's adoption of the Advanced Clean Cars II and Advanced Clean Trucks rules will result in near-optimal emissions reductions in the transportation sector, but more progress is necessary in the residential and commercial sectors. Since most energy consumption in the residential and commercial sectors arises from space heating and water heating, and because electrified alternatives such as heat pumps are readily available, the CCAP Scenario identifies installation of many more heat pumps as an essential element of meeting the State's goal. Not surprisingly, the scenario also calls for greater expansion of clean electricity to provide the additional power needed to supply the greater number of electrified devices. Additional measures are proposed to progress emission reductions from other emissions sectors including: industry, waste, agriculture, highly-warming climate pollutants (such as HFCs and methane from natural gas transmission and distribution) and sequestration from natural carbon sinks.

⁵ Not shown, removal of carbon dioxide from the atmosphere is projected to sequester 8.2 MMT CO₂e by 2050 in the Current Policy scenario, for net emissions of 56.8 MMT CO₂e.

Figure I-8. Gross Emissions projected in the CCAP Scenario.

The CCAP Scenario calls for consistent but achievable reductions over a 25-year period. The gross emissions target shown is before accounting for removal of climate pollutants due to natural sequestration processes. Sequestration is projected to remove 9.2 MMT CO₂e annually by 2050.

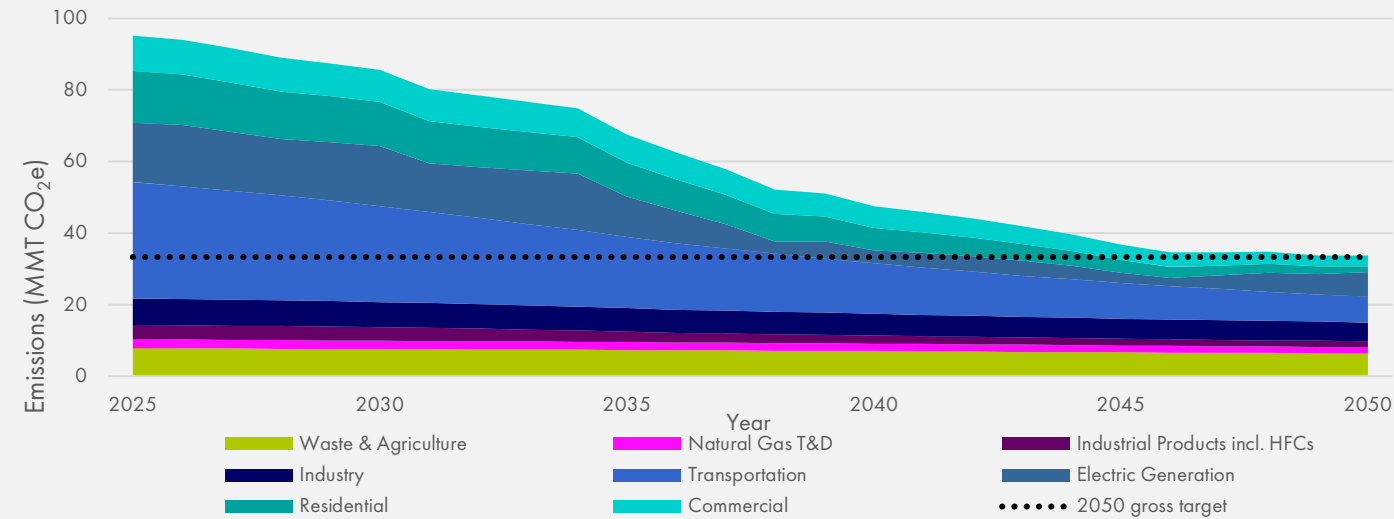
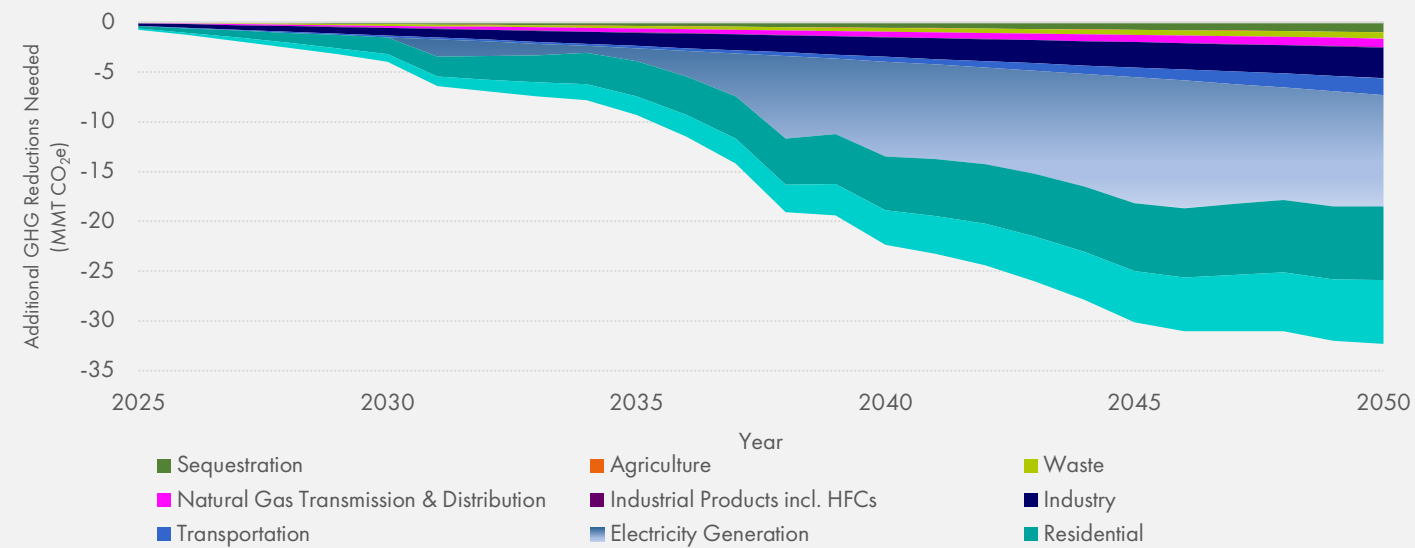


Figure I-9. Additional emissions reductions needed to meet the 80% reduction goal by 2050, beyond those resulting from current policies, as projected in the CCAP Scenario.

The greatest additional reductions are needed in the residential and commercial sectors, primarily for space heating and water heating, and in the electric sector, where additional clean energy will be needed to supply the greater number of electrified devices



Greenhouse Gas Targets

Per the New Jersey Global Warming Response Act (GWRA, P.L. 2007, c.112, as amended 2019) the State must reduce its statewide GHG emissions to at least 80% below 2006 levels by January 1, 2050. More recently, Governor Phil Murphy's Executive Order 274 established an interim target of reducing total GHG emissions to 50% of 2006 levels by 2030. The CCAP Scenario projections demonstrate a path to achieving the 2050 economy-wide target. Total gross annual economy-wide GHG emissions in 2050 under the CCAP Scenario are 33.3 MMT CO₂e and total net annual economy-wide GHG emissions in 2050 are 24.1 MMT CO₂e which means the 2050 target will be met. The CCAP Scenario projection also presents annual emissions targets for each sector in 2050. These are discussed in each sector chapter of this plan but are summarized in Table I-1.

Table I-1. 2050 GHG Emissions Targets by Sector in the CCAP Scenario.⁶

The 2024 EMP analysis modelled what emissions from each sector would be in 2050 under a scenario in which New Jersey achieves its 2050 goal.

GHG Emissions Sector	2030 Near Term Emissions under the CCAP Scenario (MMT CO ₂ e) ⁷	2050 Target under the CCAP Scenario (MMT CO ₂ e)
Transportation	26.8	7.2
Residential and Commercial	21.4	4.6
Electric Generation	16.8	6.8
Industry	7.0	5.3
Waste & Agriculture	7.6	6.3
Industrial Products including HFCs	3.8	1.6
Natural Gas Transmission and Distribution	2.3	1.8
Sequestration (NWL Sinks)	-7.6	-9.2
Net Total	78.1	24.1

New Jersey has also committed to various other targets related to the deployment of clean energy technologies through statutes and executive orders. Those are discussed within each relevant chapter of this plan.

⁶ These 2050 target values are based on what is called for under the CCAP Scenario only. If the state were to pursue GHG emissions reduction under a different 2024 EMP scenario that achieves the 80x50 goal, target values for each sector would vary slightly, though generally fall in the same range.

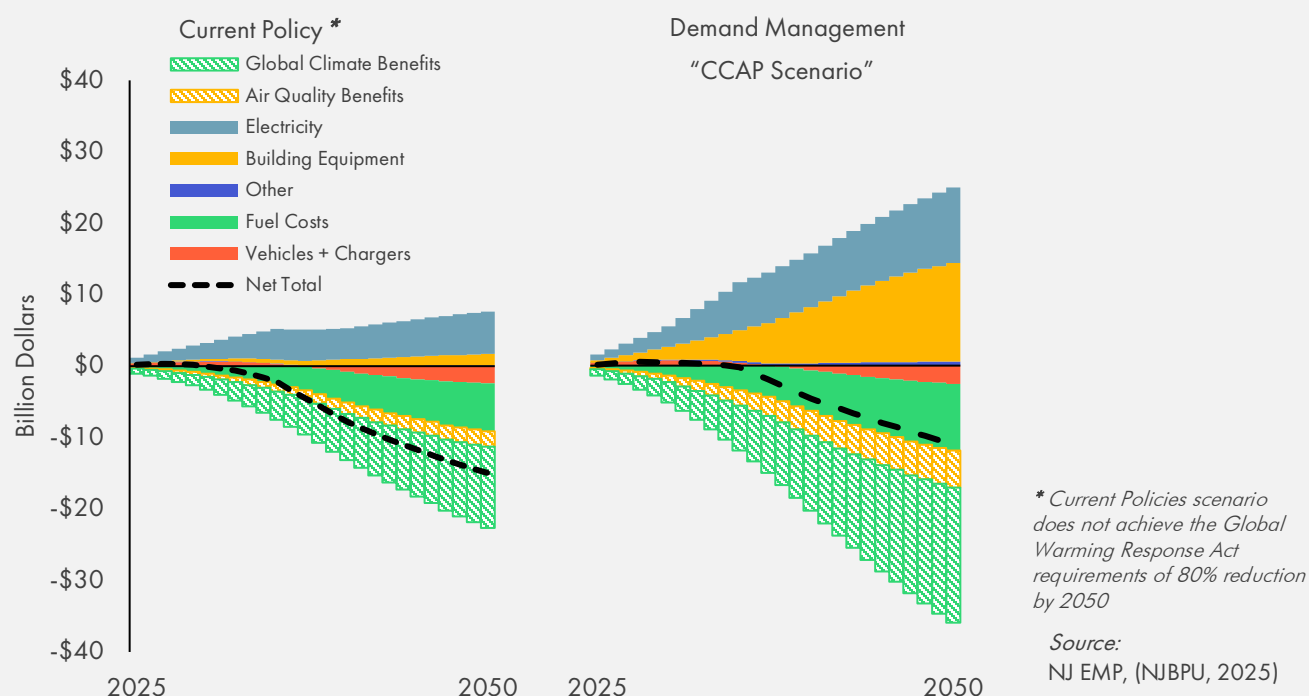
⁷ The 2024 EMP was focused on pathways to achieving the State's statutory climate goal (80% by 2050). The model for the EMP study did not include a 50% reduction in emissions from 2006 levels by 2030 as a defining parameter. Therefore 2030 emissions under the CCAP scenario do not reflect a 50% reduction.

Projected Costs and Societal Benefits of Plan Implementation

The 2024 EMP projected the estimated costs of decarbonization under a BAU Scenario where no incremental decarbonization measures are implemented; a scenario where the State continues to implement all current policies (as of 2024); and a Demand Management Scenario ("CCAP Scenario") in which the State implements the additional policies outlined in this CCAP to achieve its 2050 GHG emissions goal. The incremental costs of electricity, building equipment, and other spending categories like industrial decarbonization and non-combustion mitigation reach \$25 billion annually by 2050. However, the CCAP Scenario also saves money relative to the BAU due to lower spending on fuels and vehicles, and these avoided costs reach \$12 billion by 2050, offsetting around half of the incremental costs (NJBP, 2025). As a result, the net direct costs of the CCAP Scenario are about \$13 billion annually by 2050. However, the monetized benefits from avoided air pollution and avoided global climate damages are large, reaching \$24 billion annually by 2050, resulting in overall net benefits from reaching the state's emissions targets through the CCAP Scenario. (NJBP, 2025). The negative net costs shown in Figure I-10 mean that the societal benefits from decarbonization outweigh the costs when accounting for climate and air quality benefits. As the economy electrifies, spending shifts away from conventional fuels like natural gas and petroleum and towards electricity. For transportation electrification, the projected cost declines for electric vehicles relative to internal combustion engine vehicles means that even when accounting for electric vehicle (EV) charging infrastructure costs, there are cost savings compared to a BAU where there is no additional vehicle electrification. However, there are increased direct costs in buildings as decarbonized equipment like heat pumps space and water heaters are expected to cost more than conventional fossil fuel appliances. Costs for other categories of spending like industrial decarbonization and non-combustion emissions mitigation make up a small portion of overall costs.

The direct economic impacts to the state economy from implementing the CCAP considering the avoided costs in fossil fuel consumption and the associated societal benefits⁸ and air quality benefits⁹ is estimated to provide a net benefit of \$11.1 billion (in 2024 dollars) annually by 2050 (NJBP, 2025).

Figure I-10. Incremental Statewide Direct Costs + Societal Benefits Compared to BAU 2025-2050 (in 2024 \$).



⁸ Societal climate benefits were estimated using the social cost of carbon are global averages and may not be directly attributable to specific regions with high precision.

⁹ Air quality benefits are locally specific to New Jersey.

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GREENHOUSE GAS EMISSIONS REDUCTION STRATEGIES



STRUCTURE OF SECTOR CHAPTERS

The chapters in this plan are broadly aligned with eight sector categories as defined by the US Energy Information Agency (USEIA) (USEIA, 2025). However, because the mission of the USEIA centers on energy production and use, not climate impact, several important greenhouse pollutants are discussed as separate topics or are otherwise incorporated into related chapters. Examples include short-lived climate pollutants such as halogenated gases, which are covered in the Highly Warming Climate Pollutants Chapter; and agricultural soil management practices, which are covered in the Waste and Agriculture Chapter.

The arrangement of topics also differs from how an emissions source is addressed in governing regulations. Notably, construction equipment that uses diesel fuel is categorized by the USEIA as belonging to the industrial sector, but within the regulatory sphere it is often considered with mobile sources like diesel trucks. The list below briefly summarizes the emissions sources included in each sector.

Transportation Sector: Includes emissions from on-road and non-road transportation. Non-road transportation includes locomotives, marine transport, aviation, and cargo-handling equipment at ports.

Electricity Generation & Demand Sector: Includes emissions from grid supplied electric generation. Emissions from distributed electric generation are included with the host site or facility in the Industry and Commercial Chapters.

Residential & Commercial Buildings Sector: Includes emissions associated with structures such as homes, apartment buildings, stores, and warehouses. Also included are emissions from activities that take place within or around these structures, for example forklifts at warehouses. Energy consuming activities associated with water treatment are included in the commercial sector. However, non-energy emissions from wastewater treatment is addressed in the Waste and Agriculture Chapter.

Industrial Sector: Includes emissions from manufacturing and creation of marketable products, including petroleum refining. Agricultural energy consumption, for example powering tractors and irrigation pumps, is also included. However, release of climate pollutants from soil is discussed in the Waste and Agriculture Chapter, and sequestration of carbon in soils is discussed in the Natural and Working Lands - Carbon Sequestration Chapter. Gaseous emissions from nonroad construction equipment are included, but black carbon is discussed in the Highly Warming Climate Pollutants Chapter.

Waste & Agriculture Sector: Includes solid waste management, wastewater treatment, and agricultural emissions associated with soil management, manure management, and enteric fermentation.

Highly Warming Climate Pollutants Sector: Includes emissions associated with the halogenated gases sector, methane from natural gas transmission and distribution, and black carbon.

Natural & Working Lands - Carbon Sequestration: Considers incorporation of atmospheric carbon into agricultural croplands and grasslands, forests, wetlands, salt marshes, and developed lands.

Scenario Projections

Each sector chapter of the CCAP presents three scenario projections. The first scenario introduced is the Business-as-Usual conditions or the “BAU” Scenario. This scenario presents a set of conditions as a baseline representing what might happen if no action were taken, or if only a limited range of actions were pursued from now until 2050. It should be noted that these are only hypothetical circumstances chosen to highlight the alternatives being examined. As discussed in the individual chapters, these reference cases parallel those in the New Jersey 2024 EMP’s Integrated Energy Plan emissions modeling. The BAU Scenario does not represent certainties that there would be no legislative, regulatory, or policy intervention.

Next, each chapter of the CCAP then compares the GHG emissions projected in the BAU Scenario to a “Current Policy” Scenario and a “CCAP Scenario.” The Current Policy Scenario serves as a reference point for the infrastructure changes and GHG emission reductions that existing policies are expected to achieve assuming a continuation of all policies finalized as of May 2024. This includes policies that have been legislatively adopted and have enforcement mechanisms but does not include opt-in targets and targets set via executive order (such as the EO 316 goal of installing heat pumps in 400,000 homes by 2030). The Current Policy Scenario can be viewed as a reflection of the State’s progress to date in achieving its target of reducing net GHG emissions 80% below 2006 levels by 2050 (80x50 goal). It is important to note that the Current Policy is not a “guaranteed” emission reduction, as these policies could be reversed, delayed, or rendered invalid in the future.

The “CCAP Scenario” is the final projection presented in each chapter. This scenario assumes that the State achieves its 80x50 goal by implementing the type of infrastructure changes and GHG emissions reductions that would need to occur. The CCAP Scenario identifies the remaining gap in emissions the State must address and assumes implementation of a set of additional policies beyond what New Jersey currently has in place. The CCAP Scenario is based on the “Demand Management Scenario” from the 2024 EMP and can be understood to represent the State’s projected GHG emissions if it were to implement this CCAP. The CCAP Scenario relies on rapid electrification of buildings, transportation, and industry in New Jersey, combined with a focus on expanded efficiency in building envelopes, appliances, and manufacturing, as well as reductions in vehicle miles traveled (VMT), and the use of flexible loads from electric vehicles and building appliances to manage peak electricity demand.

The CCAP Scenario represents just *one* way the State can meet its climate emission goals, not the only way. For instance, New Jersey could consider additional or alternative actions over the next 25 years that might go beyond the pace of electrification envisioned in the CCAP Scenario or in certain instances rely more heavily on adoption of hybrid heating systems, plug-in hybrid electric vehicles, or hydrogen fuel cell vehicles to help lower peak electricity loads. The CCAP Scenario emphasizes the importance of strategies that reduce peak demand, while still achieving the levels of rapid electrification required to realize the State’s climate emissions target.

Finally, achieving the scale of emission reductions called for in the Global Warming Response Act and envisioned in this CCAP will require continuous adaptive management as new technologies and societal changes occur over the next 25 years. The measures and enabling actions proposed in the following chapters are not intended as the final word on how to achieve New Jersey’s 80x50 goal but are meant to inform the immediate next steps that should be urgently undertaken to transform each sector to dramatically reduce the State’s GHG emissions over the next 25 years.

Additional notes on modeled GHG emission projections

Projections in the CCAP are based on the latest New Jersey GHG inventory data (2021 data year) available at the time the modeling was conducted for the 2024 NJ EMP. Modeled projections are shown in the CCAP for 2025 through 2050. In sectors where methane and other highly warming gases are a significant source of GHG emissions, GHG emissions data in GWP₂₀ is included as a footnote whenever not directly included in-text. Each chapter includes a list of the conditions or assumptions used in each scenario to model emissions in that sector.

Emissions Reduction Measures and Enabling Actions

The modeling projections are followed by emissions reduction measures that NJDEP identified as potential mechanisms for achieving the level of emission reductions envisioned in the CCAP Scenario. A “measure” is a policy, project, or program that is used to reduce GHG emissions. This may include measures that reduce GHG emissions and/or measures that enhance carbon sinks. Each measure includes a description as well as quantification of the approximate GHG emissions reduction (or sequestration) potential of the measure, or of a bundle of measures in instances where reductions are highly co-dependent. Methods used for quantifying GHG emissions avoided as a result of measure implementation are included in Appendix C of this plan. Each measure is followed by a series of priority enabling actions

that are likely needed to implement the GHG reduction measure. Next, an implementation schedule and implementation approach plan are provided for each measure which identifies: information about the approximate costs of the measure; existing funding gaps, opportunities, and intersections with any federal, state, or other funding sources; the key implementing agency or agencies; a review their authority to implement and milestones that may be needed to obtain said authority; metrics for tracking progress; and the expected geographic location or scope of the measure.

Measure Timeline

In the implementation schedule timeline for each GHG reduction measure, NJDEP uses the following classification system to indicate the likely sequence of enabling action implementation:

- “Ongoing” refers to actions that are currently underway or in-process and should be continued throughout the period until 2050 or completed by timeframes noted above.
- “Near-term” actions are those that should be completed in the years 2025-2030.
- “Mid-term” actions are those that should be completed in the years 2030-2040.
- “Long-term” actions are those that should be completed in the years 2040-2050.

Cost of Measures

Information about the approximate cost to the State of implementing each measure is provided in the implementation tables. Measure implementation costs are represented using a relative costs scale which is intended to suggest the relative implementation costs to the State for each measure. The range of costs for each category in the scale are defined as:

- “High” = >\$1B
- “Medium-high” = \$500M - \$1B
- “Medium” = \$100M - \$500M
- “Low” = <\$10M
- “No cost” = no direct costs to state government are expected

Each measure’s estimated costs were evaluated differently. Estimation methods varied from analogous estimation, to estimating incremental costs per ‘widget’ or per MWh, to cost per metric ton of CO₂e avoided, or qualitatively considering potential costs where there are not expected to be direct costs for the State associated with implementation. The actual costs of implementing any of these measures is highly variable and dependent on policy or program design. Relative cost estimates are provided as a requirement of the USEPA’s Climate Pollution Reduction Grant (CPR Grant) and are meant to be illustrative only. In several cases, estimates were unable to separate state government costs from costs that private industry or consumers would also bear, and therefore many of these estimates assume the State would carry the full cost, while in reality these costs would likely be shared. For some measures, certain costs cannot be known or estimated at this time and therefore are noted as “unknown.” It is also important to note that these cost estimates do not take into consideration the ‘cost of inaction’ or the external, social costs associated with our failure to reduce carbon emissions. Net societal benefits of implementing this plan are discussed in the GHG Projections and Targets section of this plan.

Stakeholder Feedback

The USEPA’s CPR Grant requires recipients to demonstrate that they conducted meaningful engagement as part of the development of their climate plans (USEPA, 2023). This includes communicating with low-income and disadvantaged communities about emissions reductions in their communities and identifying their priorities.

As a result, each sector chapter of the plan also includes a brief summary of the public stakeholder feedback collected to date that was used to inform the development of this CCAP. Feedback is derived from a number of sources, principally

from in-person and virtual community listening sessions that NJDEP conducted with leaders and community members from the State's overburdened communities (OBCs), as well as a comprehensive review of 2024 EMP written public comments. Additionally, NJDEP evaluated prior comments, reports, and other comments from public engagement sessions completed since 2018 that relate to climate emissions mitigation in New Jersey. This feedback is included to both provide context on public opinion regarding emissions reduction strategies and to demonstrate how the plan's proposed measures and enabling actions are in several cases responsive to public comments and the priorities of New Jersey's OBCs. In instances where measures may not be directly responsive to public comments or OBC priorities, the feedback documents additional perspectives and issues that NJDEP and other state agencies might consider addressing in the future. Full details on NJDEP's community engagement and a list of community priorities for climate action identified through the engagement process are included in Appendix B.

SUPPLEMENTAL ELEMENTS

Beyond the sector chapters, New Jersey's CCAP also explores other important ideas and elements to support the State's future work.

Wholistic, Cross-Sector Approaches

While the sector chapters noted above identify measures the State could take to reduce emissions in each sector of its emissions inventory, New Jersey will likely need to explore other cross-sector strategies over the next 25 years. These wholistic approaches could reduce GHG emissions from sources in multiple sectors or across the entire economy. These approaches contain both specific actions and broad strategic initiatives. They are presented as additional considerations, rather than emissions reduction measures, which the State could pursue to further drive emission reductions in the long-term, create co-benefits, and protect against the threat climate change poses to the State.

Community Benefits Analysis

The benefits analysis assesses the benefits of implementing the full suite of GHG reduction measures across the full geographic scope of the plan as well as specifically in overburdened communities. From COBRA modeling consistent with the scenario projections above, on a state-wide level it includes base year (2020) estimates and estimated changes in co-pollutant levels in 2035 and 2050 that would result from implementation of the plan's measures. This includes both state-wide and county level quantification of the monetized health benefits of implementation of the plan's measures. Co-pollutant emissions include criteria pollutants such as fine particulate matter (PM_{2.5}) and sulfur dioxide (SO₂), and air toxics such as benzene, lead, and mercury. For measures where it was feasible, specifically offshore wind and solar measures under the Electricity Generation and Demand sector, it provides measure-specific estimates of health benefits. The analysis also includes a literature review and broader assessment of other benefits and disbenefits associated with the implementation of the GHG reduction measures. The benefits include, for example, improved public health outcomes, economic benefits, and increased climate resilience. The benefits analysis continues with a review of each county's demographics and populations at greatest risk and that stand to be impacted the most by the plan's measures. Finally, the analysis summarizes the stakeholder input relevant to the measures in this plan. This section is summarized in the main body of the plan, while the full report is included as Appendix D.

Workforce Planning Analysis

This analysis considers the workforce related challenges and opportunities related to the eight sectors in the CCAP as represented by selected industries and occupational codes. This includes the following;

- An analysis of workforce trends over time, including any anticipated workforce shortages that could prevent the implementation of measures and achievement of the goals described in the CCAP
- Analyses of workforce demographics

- An inventory of workforce development infrastructure, including education and training programs
- An examination of relevant ongoing climate investments in the State, to provide greater context regarding the State's workforce capacity

The analysis also identifies common barriers that underserved communities may experience in accessing education, training and employment opportunities, especially in the green economy. It concludes with workforce development strategies and recommendations to address gaps in workforce development for the eight sectors. This includes potential solutions and partners at the state, regional, and/or local level that are equipped to help address those challenges.

This section is summarized in the main body of the plan, while the full report is included as Appendix E.

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USEIA. (2025). Glossary: Energy-Use Sector. Retrieved October 2025, from https://www.eia.gov/tools/glossary/index.php?id=E#en_use_sector

USEPA. (2023, March 1). Climate Pollution Reduction Grants Program: Formula Grants for Planning - Program Guidance for States, Municipalities, and Air Pollution Control Agencies. Washington D.C.: United State Environmental Protection Agency, Office of Air and Radiation. Retrieved from <https://www.epa.gov/system/files/documents/2023-02/EPA%20CPRG%20Planning%20Grants%20Program%20Guidance%20for%20States-Municipalities-Air%20Agencies%2003-01-2023.pdf>

An aerial photograph of a large blue steel suspension bridge spanning a wide river. The bridge has two tall towers and is filled with cars and trucks. The sun is low in the sky, creating a bright reflection on the water's surface. The surrounding landscape is lush with green trees and some buildings are visible in the distance.

TRANSPORTATION

CHAPTER 1

TRANSPORTATION SECTOR SNAPSHOT

2022 NJ EMISSIONS ACTIVITIES AND DATA

Transportation emissions come from the operation of on-road motor vehicles such as light-duty cars, trucks and sport utility vehicles (SUVs), and medium- and heavy-duty vehicles used for commercial operations such as buses, goods transport and delivery services, and non-road modes of transportation such as trains, boats, and airplanes. The transportation sector emitted 38.4 MMT CO₂e in 2022.

- Transportation emissions
- Total GHG emissions from all other sectors



2022 Emissions (MMT CO₂e) (GWP₁₀₀)

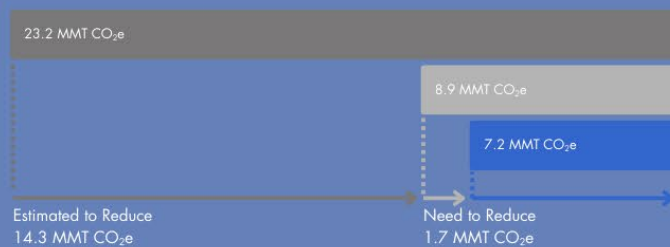
GHGS OF CONCERN

- Carbon Dioxide (CO₂)
- Nitrous Oxide (N₂O)

EMISSIONS GOAL

7.2 MMT CO₂e

2050 EMISSIONS PROJECTIONS



- BAU Scenario
- Current Policy Scenario
- CCAP Scenario

Note: This figure is for illustrative purposes and is not presented to scale.

GHG REDUCTION MEASURES AND ENABLING ACTIONS

Measure 1: Continue to implement all current policies and expand current transportation electrification programs

- 1.1 Implement Advanced Clean Trucks Rule
- 1.2 Implement Advanced Clean Cars I + II Rules (rules take effect in 2027)
- 1.3 Implement policies to increase the light-duty EV sales share
- 1.4 Increase availability of light-duty electric vehicle charging infrastructure
- 1.5 Implement policies to increase the medium- and heavy-duty zero-emission vehicle sales share
- 1.6 Implement policies to decarbonize transit vehicles
- 1.7 Increase availability of medium- and heavy-duty electric vehicle charging infrastructure
- 1.8 Implement policies to increase the non-road ZEV sales share
- 1.9 Support workforce development efforts related to zero-emission vehicles

Measure 2: Implement a GHG reduction planning standard for State and Metropolitan Planning Organization's transportation plans

- 2.1 Revise project scoring criteria to include GHG and/or VMT impacts
- 2.2 Pass legislation to require coordination between transportation planning and GHG reduction
- 2.3 Set a statewide light-duty VMT reduction target
- 2.4 Create a commission or technical advisory committee to assess the GHG impacts and support implementation of a planning standard

Measure 3: Implement large-scale public transit projects and policies to increase transit ridership

- 3.1 Continue to support the planning, construction and completion of the full Gateway Program and supporting Gateway Projects
- 3.2 Continue to plan, construct and make operational the Glassboro-Camden Light Rail (LRT) and South Jersey Bus Rapid Transit (BRT) Projects
- 3.3 Plan, construct and make operational the Hudson-Bergen Light Rail "Northern Branch Corridor" Extension Project
- 3.4 Plan, construct and make operational the Secaucus to Meadowlands (Boonton) Transitway
- 3.5 Plan, construct and make operational the Lackawanna Cutoff Project
- 3.6 Explore the adoption of various policies to increase transit ridership

Measure 4: Explore new pricing mechanisms, and other transportation alternatives that reduce VMT and emissions

- 4.1 Continue to explore alternatives for the State gas tax, such as a VMT fee
- 4.2 Explore other pricing mechanisms such as congestion-pricing and parking cash out incentives
- 4.3 Provide support and incentives for telework and other strategies that reduce transportation demand

OVERVIEW

The transportation sector is comprised of on-road motor vehicles such as light-duty cars, trucks and sport utility vehicles (SUVs), and medium- and heavy-duty vehicles used for commercial operations such as buses, goods transport and delivery services. It also includes non-road modes of transportation such as trains, boats, and airplanes.¹ Emissions from mobile equipment that are not primarily used for transportation, for example backhoes, cranes, and material handling equipment, are included in the chapter for the sector in which they are used. From a practical and operational perspective, strategies to reduce emissions from mobile equipment not primarily used for transportation are included in this chapter. Carbon dioxide (CO₂) is the primary climate pollutant of concern from transportation.²

The transportation sector, the largest source of New Jersey's greenhouse gas (GHG) emissions, must be the foremost focus of efforts to reduce emissions. To achieve the 80x50 goal, the 2024 Energy Master Plan (2024 EMP) projects that transportation emissions must be reduced by 85%, from recent levels to 7.2 million metric tons (MMT) carbon dioxide equivalent CO₂e or below by 2050 (NJBP, 2025). Achieving these emissions reductions is predicated on decarbonizing electric generation through the deployment of clean and renewable energy. However, this challenge is compounded by the significant increase in electric demand that will result from the electrification of transportation and the building sector. The 2024 EMP modeled an increase in New Jersey's electric demand from the current 75 GWh to 167 GWh by 2050.

Currently, gasoline-fueled vehicles account for nearly 80% of the transportation sector's emissions. The Comprehensive Climate Action Plan (CCAP) scenario, explored in this report, which assumes a fifteen-year lifecycle, projects that nearly 60% of new light-duty passenger vehicle sales (passenger cars and light-duty passenger trucks) will need to be battery electric, plug-in hybrid electric, or hydrogen-powered by 2030, with sales rising to 100% by 2035, in order to achieve the 80x50 goal. It also anticipates that sales of new plug-in hybrids would be phased out by 2050 in favor of passenger vehicles that do not use any fossil fuels. This strategy, coupled with those that reduce vehicle miles travelled (VMT) and vehicle electricity demand and complementary social approaches like supporting livable, walkable communities, will ensure that New Jersey reaches its transportation emissions goals.

¹ Because the transportation sector is broadly intertwined across state and national boundaries, activities are often not fully within the jurisdiction of the State of New Jersey. In certain cases, State regulation is preempted by federal interstate commerce laws. Further, in-state purchase data for jet kerosene, rail distillate and marine residual fuels reported to the United States Energy Information Agency are not closely linked to in-state emissions. Due to these complexities, emissions reduction strategies for aviation, rail and marine transportation are not investigated in this report beyond activities occurring wholly within the state, for example freight handling at ports.

² Methane and nitrous oxide are produced in small quantities during combustion of fossil fuels, contributing between 0.3% and 0.6% to overall warming impact. Because these contributions are so small, estimated emissions based on 20-year global warming potential (GWP₂₀) and 100-year global warming potential (GWP₁₀₀) are nearly identical and discussion in this chapter does not distinguish between the two.

WHERE WE STAND

Each mode of transportation has different characteristics that determine how climate emissions are estimated. With respect to on-road transportation, New Jersey used the United States Environmental Protection Agency’s (USEPA) MOVES model (USEPA, 2023) to calculate emissions for its most recent GHG inventory covering years through 2022. MOVES uses information on fleet composition, VMT, and fuel efficiency to calculate highly detailed assessments of GHG, on-road black carbon and conventional air pollutants. Data presented here for 2006, and 2018 through 2022, is based directly on MOVES output. Data for years 2007-2018 were based on fuel consumption data from the United States Energy Information Agency (USEIA), adjusted to align with MOVES results for 2006 and 2018.³

Contributions from New Jersey’s transportation sector dominate the state’s overall emissions profile. During 2022, the sector is estimated to have released 38.4 million metric tons of CO₂e.⁴ This represented about 39% of the State’s net emissions of 97.6 MMT (NJDEP, 2025). Proportionally, this percentage is higher than in most other states because a large portion of New Jersey’s electric generation is comprised of carbon free nuclear energy and efficient, combined-cycle natural gas plants. The steadily growing development of solar photovoltaic electricity has also made the State’s electricity sector even cleaner.

Historical estimates (Table 1.1 and Figure 1.1) show a slight downward trend in transportation emissions since 2005, largely attributable to modest reductions from on-road gasoline-powered vehicles. In 2022, on-road gasoline⁵ accounted for 74% of the State’s transportation-related emissions (Figure 1.2). On-road diesel contributed an additional 19%. Other on-road fuels, including E-85 gasoline-ethanol blend and compressed natural gas (CNG), contributed 0.5% such that on-road fuels were responsible for 93% of the sector’s total emissions. Remaining emissions in the sector come from non-road applications, including rail (diesel), aviation (jet fuel and aviation gasoline), and marine (diesel, residual fuel oil, and gasoline). Together, these non-road applications contributed 7% to the transportation sector’s total emissions.

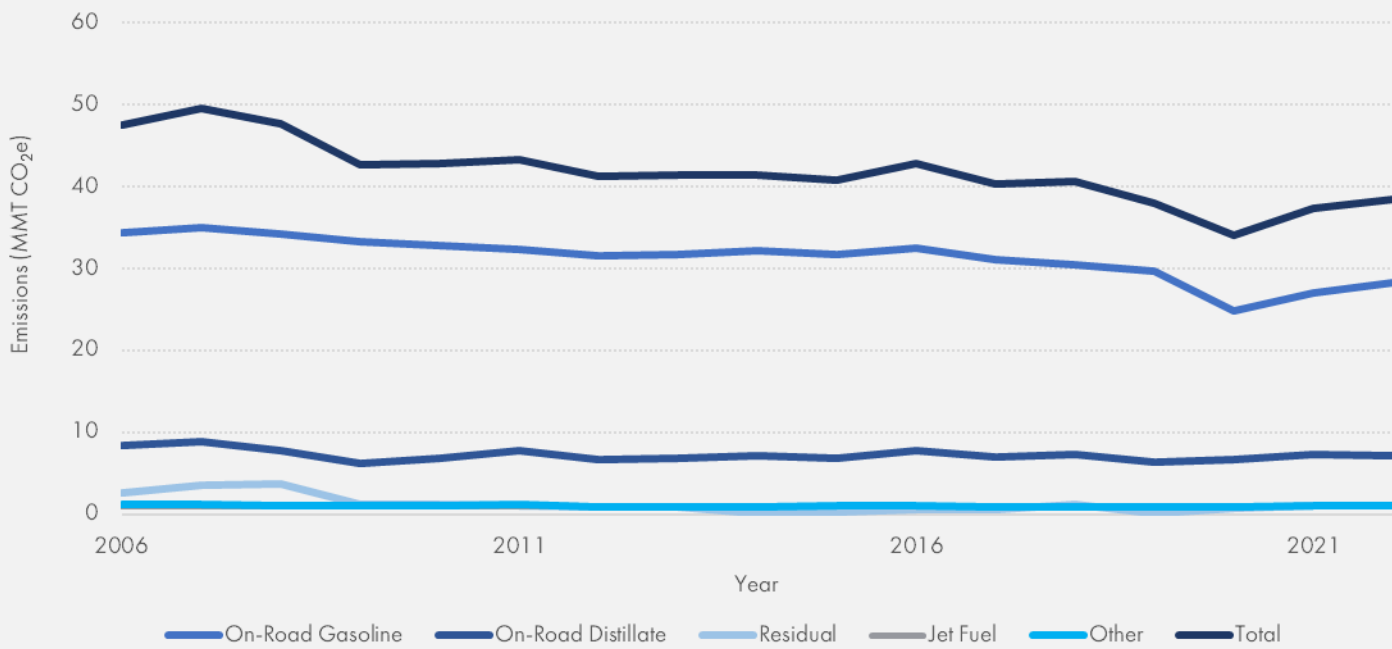
In 2022, the Transportation sector is estimated to have released 38.4 million metric tons of CO₂e. This represents 39% of New Jersey’s net emissions

Table 1.1. Annual Transportation Sector Greenhouse Gas Emissions 2006 – 2022 (MMT CO₂e).

	2005	2006	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
GWP ₁₀₀	47.4	47.5	41.4	41.4	40.7	42.8	40.3	40.6	38.0	34.0	37.3	38.4

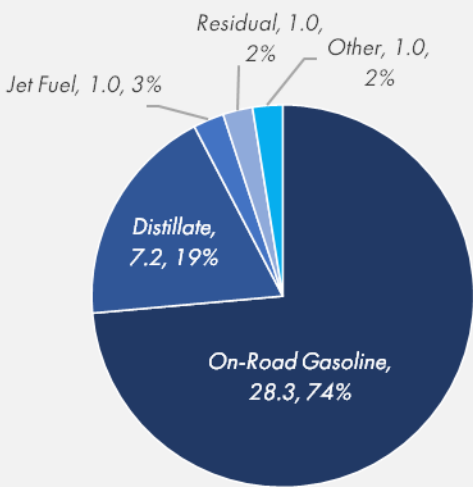
³ Additional information regarding the analysis method was published in the NJDEP Greenhouse Gas Inventory Report (2024). (NJDEP, 2024)
⁴ CO₂e stands for carbon dioxide equivalent, which also accounts for the effects of related gases such as methane and nitrous oxide.
⁵ Gasoline includes E-85 gasoline-ethanol blend except where E-85 is specifically identified. E-85 use is very limited in the State, accounting for only 0.1% of on-road emissions during 2022. Compressed natural gas (CNG) is also used in small quantities, contributing 0.4% to on-road emissions. Where noted, CNG emissions are combined with diesel emissions since both are used primarily for heavy-duty vehicle applications.

Figure 1.1. Historical Emissions from New Jersey’s Transportation Sector, by Fuel Type.
Emissions from the transportation sector have decreased by about 19% since 2006, due primarily to modest reductions in on-road gasoline consumption.



On closer inspection, 84% of VMT arose from just two vehicle types: gasoline-powered light-duty trucks, such as pickups and SUVs, and gasoline-powered passenger cars (Figure 1.3). Combined, these two modes of transport accounted for 71% of on-road emissions, or about 25 MMT CO₂e (Figure 1.4). Commercial trucks⁶ contributed 25% of on-road emissions while only making up 12% of VMT (Table 1.2).

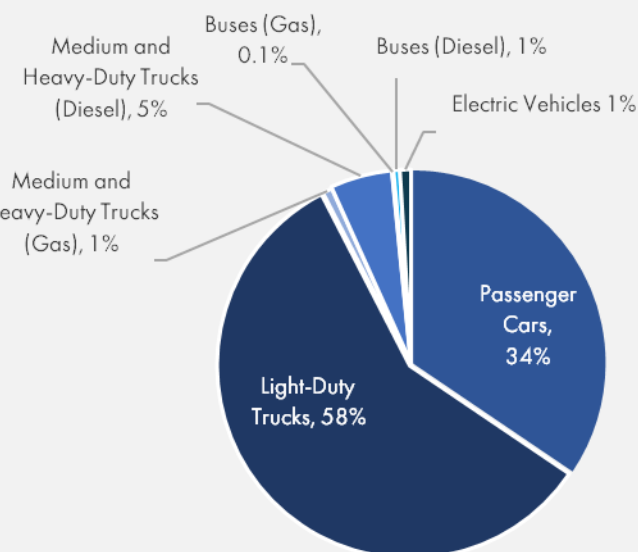
Figure 1.2. 2022 NJ Transportation Emissions by Fuel Type (MMT CO₂e and Percent).
On-road gasoline represents the greatest source of emissions in the transportation sector, with on-road diesel also making a sizeable contribution. Together, these two fuels account for over 92% of the sector’s emissions.



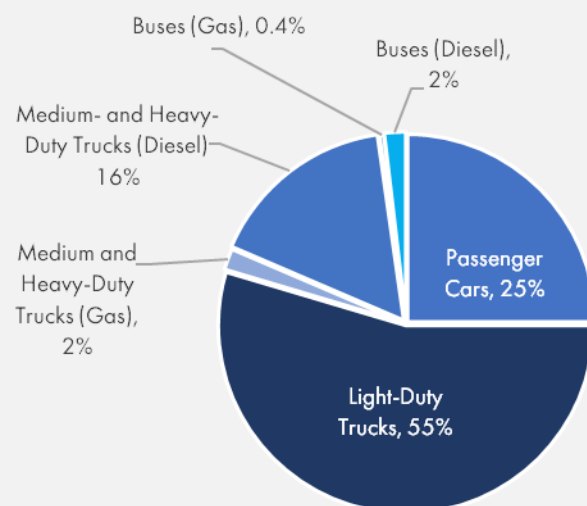
⁶ The Commercial truck category includes the following: Gas Single Unit Short-Haul Truck, Gas Single Unit Long-Haul Truck, Gas Combination Short-Haul Truck, Gas Light Commercial Truck, Diesel Combination Short-Haul Truck, Diesel Combination Long-Haul Truck, Diesel Single Unit Short-Haul Truck, Diesel Single Unit Long-Haul Truck, and Diesel Light Commercial Truck. This category does not include Refuse Trucks, Passenger Trucks, Buses, or Motor Homes.

Figure 1.3. 2022 Vehicle Miles Traveled (75.3 billion miles total).

Passenger cars, and light-duty trucks together accounted for 92% of roadway miles traveled in the state. The light-duty truck category in this Figure includes light-duty commercial trucks as well as passenger trucks.

**Figure 1.4. 2022 On-Road Emissions by Vehicle Category (35.6 MMT CO₂e total).**

Passenger cars and light-duty trucks together emitted 80% of the greenhouse gases that come from on-road vehicles. The light-duty truck category in this Figure includes light-duty commercial trucks as well as passenger trucks.

**Table 1.2. Estimated New Jersey On-Road Emissions for 2022 (USEPA MOVES Model Output).⁷**

The MOVES model provides detailed estimates of emissions for a wide range of on-road vehicles. Motor vehicles using fuel that is 85% ethanol (E-85) are included in the estimates for gasoline vehicles, while vehicles using CNG are included in the diesel estimates. Vehicles using E-85 and CNG only account for about 0.5% of total on-road emissions.

OVERALL EMISSIONS AND VEHICLE MILES TRAVELED IN 2022				
Fuel Type	CO ₂ e Metric Tons	VMT	Percent Total of Emissions	
Gasoline	28,207,327	68,740,610,471	79.2%	
Diesel Fuel	7,202,470	5,692,242,820	20.2%	
CNG	147,590	67,831,935	0.4%	
E-85	46,166	111,815,579	0.1%	
Electric	0	702,159,221	0.0%	
Total	35,603,552	75,314,660,026	100%	
BREAKDOWN BY VEHICLE TYPE				
Gasoline Vehicles ⁸	CO ₂ e Metric Tons	VMT	Emissions as % Of Gas + Diesel Total	VMT as % Of Gas + Diesel Total
Passenaer Truck	16,292,365	37,635,512,256	45.8%	50.0%

⁷ This Table does not include non-road modes of transport such as rail, aviation and marine.

⁸ Includes E-85

COMPREHENSIVE CLIMATE ACTION PLAN

Passenger Car	8,695,691	25,412,771,633	24.4%	33.7%
Light Commercial Truck	2,315,737	4,691,220,506	6.5%	6.2%
Single Unit Short-Haul Truck	596,902	565,362,445	1.7%	0.8%
Motorcycle	154,037	407,016,453	0.4%	0.5%
Other Bus	86,218	50,895,670	0.2%	0.1%
Transit Bus	41,046	25,175,645	0.1%	0.0%
Motor Home	40,319	37,579,833	0.1%	0.0%
Single Unit Long-Haul Truck	17,076	16,511,605	0.0%	0.0%
School Bus	13,617	10,030,021	0.0%	0.0%
Refuse Truck	454	329,516	0.0%	0.0%
Combination Short-Haul Truck	32	20,467	0.0%	0.0%
Gasoline and E-85 Total	28,253,493	68,852,426,050	79.4%	91.4%
Diesel Vehicles ⁹	CO ₂ e Metric Tons	VMT	Emissions as % Of Gas + Diesel Total	VMT as % Of Gas + Diesel Total
Combination Long-Haul Truck	3,172,267	1,768,886,330	8.9%	2.3%
Single Unit Short-Haul Truck	1,409,223	1,422,385,463	4.0%	1.9%
Combination Short-Haul Truck	987,135	560,168,070	2.8%	0.7%
Passenger Truck	627,462	1,011,630,710	1.8%	1.3%
Other Bus	306,879	166,872,322	0.9%	0.2%
Light Commercial Truck	201,116	307,902,798	0.6%	0.4%
School Bus	187,907	138,436,865	0.5%	0.2%
Refuse Truck	176,091	93,262,868	0.5%	0.1%
Transit Bus	168,083	92,344,057	0.5%	0.1%
Passenger Car	51,073	136,009,012	0.1%	0.2%
Single Unit Long-Haul Truck	37,535	40,574,760	0.1%	0.1%
Motor Home	25,288	21,601,500	0.1%	0.0%
Diesel and CNG Total	7,350,059	5,760,074,755	20.6%	7.6%

Business-as-Usual Scenario

The Business-as-Usual (BAU) scenario describes the trajectory of GHG emissions from the transportation sector without any emissions reductions policies or significant behavior changes from current vehicle miles travelled and electric vehicle (EV) adoption rates. This baseline scenario projects a future of continued emissions due to sustained reliance on fossil fuels. The Transportation Sector BAU scenario assumes the following circumstances:

- Advanced Clean Cars (ACC), Advanced Clean Cars II (ACC II) and Advanced Clean Trucks (ACT) regulations do not move forward;
- No reductions in VMT;
- Light-duty EV sales remain constant at a 1% rate until 2050¹⁰;
- Medium-and heavy-duty fossil fueled (internal combustion engine) vehicle sales remain constant at 100% until 2050; and

⁹ Includes CNG

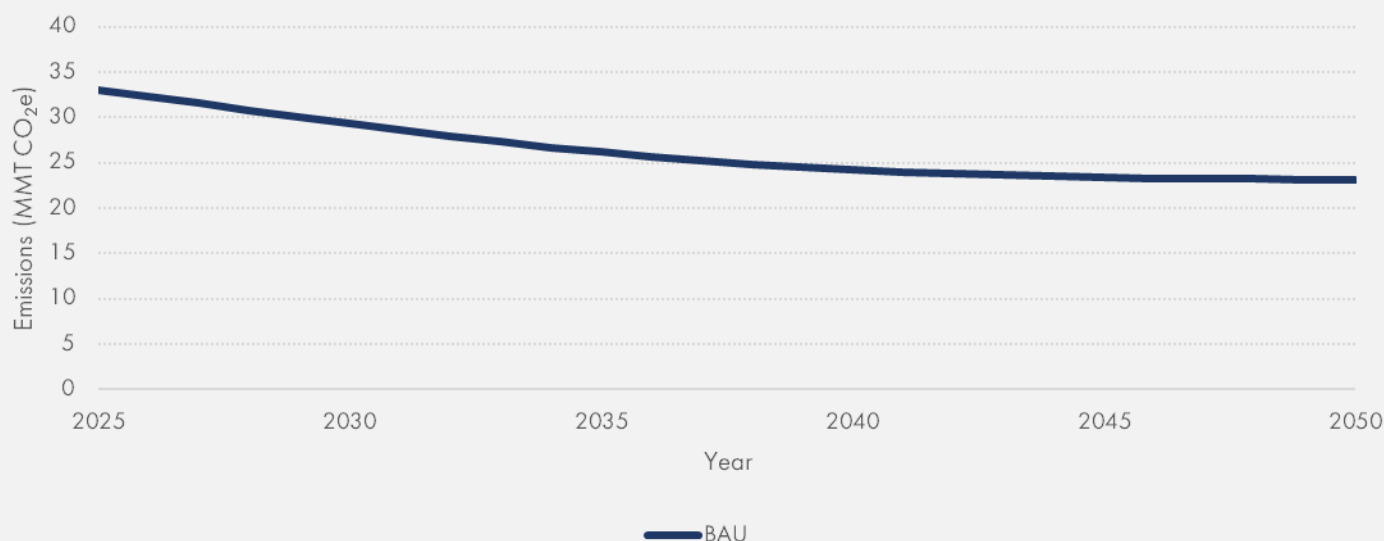
¹⁰ EVs currently account for 2.97% of registered vehicles in the State, and 13.5% of new vehicle sales.

- Improved efficiency of internal combustion engine vehicles, due to phase out of older, less efficient vehicles with newer vehicles which have better fuel economy.

Under these conditions, GHG emissions from the transportation sector drop to 23.2 MMT CO₂e in 2050 (Figure 1.5). This reduction is driven by the replacement of older, less efficient vehicles with newer, more fuel-efficient models. Emissions reductions are realized in the near term (prior to 2035), with reductions leveling off in the longer term.

Figure 1.5. New Jersey Transportation Sector 2020-2050 Business-as-Usual Projection (MMT CO₂e).

Emissions reductions under the BAU scenario are due to the replacement of older, less efficient internal combustion vehicles, however, New Jersey would not be on track to achieve its 80x50 goal.



Current Policy Scenario

The current policy scenario reflects potential future outcomes based on existing policies (as of May 2024) and their anticipated continuation. This serves as a benchmark or progress report for the impact of policies currently on the books. For the purposes of this chapter the Current Policy Scenario assumes the following circumstances:

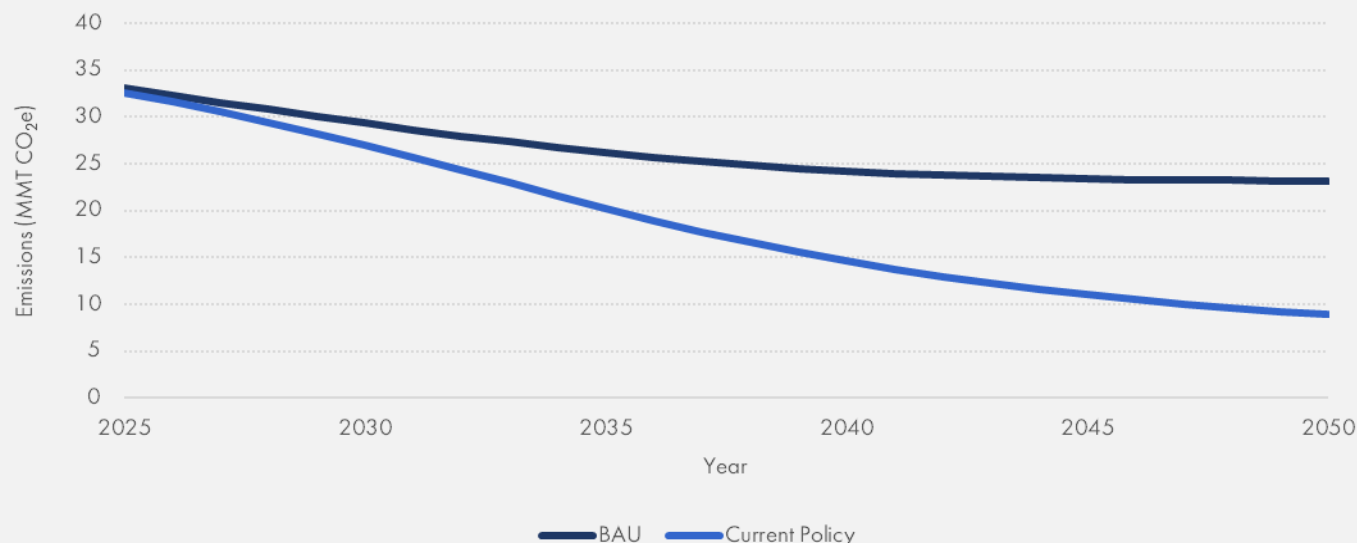
- ACC, ACC II and ACT regulations move forward
- No reductions in VMT
- Light-duty zero-emission vehicle sales reach 100% by 2035
 - 80% of light-duty zero-emission vehicle sales are battery electric vehicles (BEVs) and 20% are plug-in hybrid electric vehicles (PHEVs)
- Medium- and heavy-duty zero-emission vehicle sales reach 61% of new vehicle sales by 2040
 - 87% of non-bus zero-emission medium- and heavy-duty vehicle sales are battery electric and 13% are hydrogen fuel cell electric vehicles (FCEVs)
 - Electric bus sales reach 44% by 2035¹¹

Under these conditions, the ACCII and ACT program drive significant zero-emission vehicle adoption. GHG emissions from the transportation sector would fall to 8.9 MMT CO₂e by 2050 (Figure 1.6). This outcome would still leave New Jersey 1.7 MMT CO₂e short of achieving its 80x50 emissions reduction goal for this sector.

¹¹ Electric bus includes all categories of buses, including transit, school and other.

Figure 1.6. New Jersey Transportation Sector, Current Policy and Business-as-Usual, 2020-2025 Scenario (MMT CO₂e).

The Current Policy Scenario, if fully implemented, will reduce transportation emission to 8.9 MMT CO₂e by 2050.



Critical Existing Emissions Reduction Policies ¹²

Under the administration of Governor Phil Murphy, New Jersey has amplified its efforts to reduce emissions from the transportation sector, focusing on expanding electrification of in-state transportation and ensuring build-out of EV charging infrastructure. State agencies are coordinating their efforts to pursue these goals in support of mass adoption. Since the release of the 80x50 Global Warming Response Act in the fall of 2020, the State of New Jersey has continued to adopt transformative transportation policies. Three major policies (ACC, ACC II and ACT) are drivers for the emissions reductions modeled in the Current Policy Scenario. While the future of these programs is uncertain due to federal government actions, New Jersey's dedication to clean transportation remains strong through commitments like the New Jersey EV Law (New Jersey State Code, 2019) and the Medium- and Heavy-duty Vehicle Memorandum of Understanding (Northeast States for Coordinated Air Use Management, 2020). These commitments also work to support New Jersey's momentum towards the outcomes projected under the current policy scenario.

Advanced Clean Cars

The California Low Emission Vehicle program and zero-emission vehicle sales requirements became effective in New Jersey in 2009. In 2012, California combined these programs, along with greenhouse gas standards, into the Advanced Clean Cars program, which New Jersey incorporated into its rules. This program works to ensure consumers have greener choices by requiring passenger vehicle manufacturers to offer advanced vehicle technologies including zero-emission, partial zero-emission, and transitional zero-emission vehicles for sale in New Jersey. This program applies to vehicles through model year 2025.

Advanced Clean Cars II

Adopted in November 2023, the Advanced Clean Cars II (N.J.A.C. 7:27-29A) regulation requires passenger vehicle manufacturers to sell increasing percentages of zero-emission vehicles each year, ramping up to 100% of new vehicle sales being zero-emission by 2035. ACC II is anticipated to propel significant transportation sector emissions reductions.

Advanced Clean Trucks

In November 2021, New Jersey adopted the Advanced Clean Trucks (N.J.A.C. 7:27-31) regulation, which requires manufacturers of medium- and heavy-duty vehicles to deliver an increasing percentage of zero-emission vehicles. The requirements increase annually through 2035, at which point 55% of Class 2b to 3 vehicles, 75% of Class 4 to 8 straight trucks, and 40% of Class 7 and 8 tractor trailers must be zero-emission.

¹² Refer to the 80x50 GWRA report for a summary of relevant policies prior to 2020.



THE PATH FORWARD

The BAU scenario shows that if no action is taken, emissions from the transportation sector will fall to 23 MMT CO₂e by 2050 due to the standard fleet turnover to newer vehicles with better fuel economy. The Current Policy Scenario realizes deeper reductions in the transportation sector, with emissions dropping to 8.9 MMT CO₂e by 2050, but relies on the implementation of three major regulatory policies whose future is uncertain due to recent policy activities at the federal level. The CCAP scenario calls for more significant transportation sector emissions reductions, coupling vehicle electrification efforts with establishing a goal of reducing light-duty VMT by 3% by 2050. Under the CCAP scenario, transportation sector emissions would total 7.2 MMT CO₂e by 2050 (Figure 1.7), bringing the State closer to reaching the economy-wide goal.

Four measures have been identified that will be necessary to achieve the scale of emissions reductions envisioned in the CCAP Scenario. The first measure relies on maintaining current regulatory policies and transportation programs that target vehicle electrification. Measures 2 through 4 seek to reduce VMT, recognizing that the cleanest mile is the one not driven.

- **Measure 1:** Continue to implement all current policies and expand current transportation electrification programs
- **Measure 2:** Implement a GHG reduction planning standard for State and Metropolitan Planning Organizations' transportation plans
- **Measure 3:** Implement large-scale public transit projects and policies to increase transit ridership
- **Measure 4:** Explore new pricing mechanisms, and other transportation alternatives that reduce VMT and emissions

2050 SECTOR EMISSION GOAL

7.2 MMT CO₂e

EMISSION ACTIVITIES

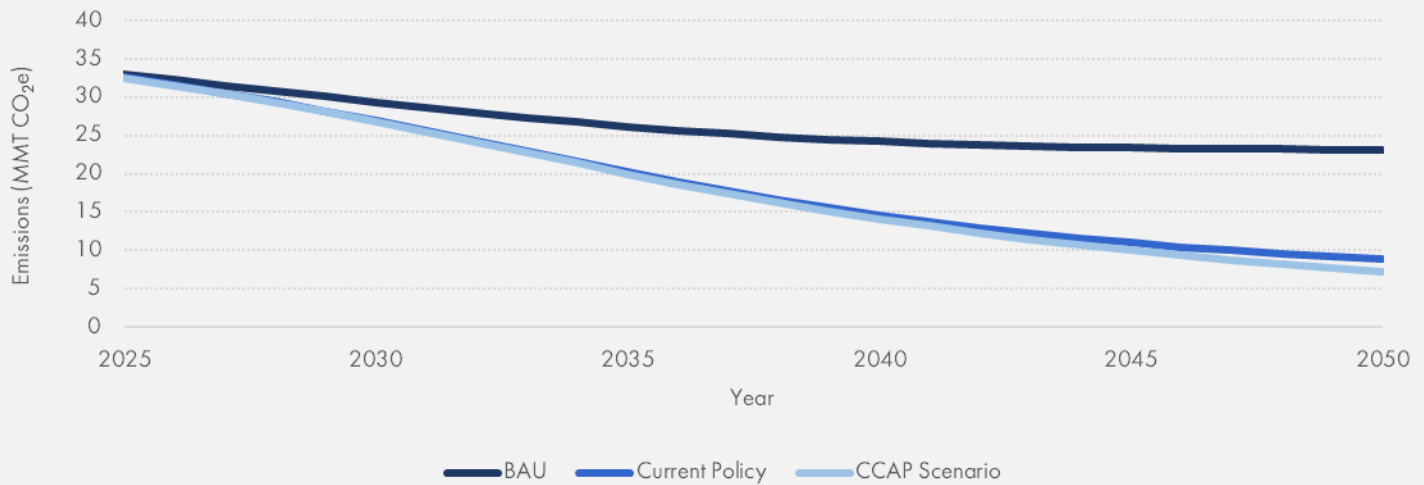
- Moving people using fossil-fuel powered vehicles
- Shipping goods using fossil-fuel powered transportation

EMISSIONS REDUCTION MEASURES

1. Continue to implement all current policies and expand current transportation electrification programs
2. Implement a GHG reduction planning standard for State and Metropolitan Planning Organizations' transportation plans
3. Implement large-scale public transit projects and policies to increase transit ridership
4. Explore new pricing mechanisms, and other transportation alternatives that reduce VMT and emissions

Figure 1.7. New Jersey Transportation Sector under the CCAP Scenario, 2020-2025 (MMT CO₂e).

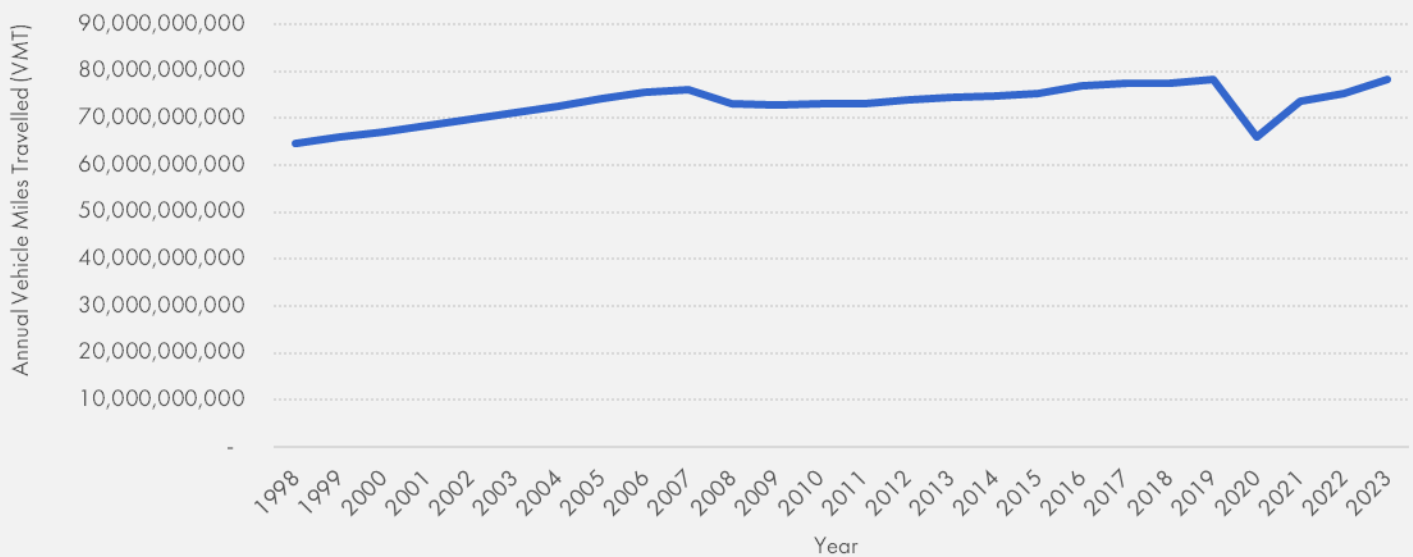
Electrification of New Jersey's fleet coupled with VMT reduction measures can reduce the state's emissions to 7.2 MMT CO₂e by 2050.



Collectively, a combination of policies based on the above strategies can accelerate the reduction of transportation sector emissions to the goal of 7.2 MMT CO₂e emissions by 2050. The individual measures are interactive, meaning that a strong success in one category can enhance or detract from the potential gains in another. It is therefore necessary to consider each pathway separately before studying how they can be combined to create optimal benefits. For New Jersey to reduce GHG emissions across the entire transportation system and reach its climate goals, strategies beyond electrification will be necessary. In 2022, passenger cars, and light-duty trucks together accounted for 92% of roadway miles traveled in the State and were responsible for 80% of the greenhouse gases that come from on-road vehicles. Overall statewide VMT in New Jersey has increased by more the 17% since 1998 (Figure 1.8) (NJDOT, 2023) and is generally projected to grow by 2050 (US FHWA, 2024) (DVRPC, 2021) (NJTPA, 2021).¹³

Figure 1.8. Estimated New Jersey Annual VMT from 1998 to 2023.

Despite a reduction in VMT associated with the Covid-19 pandemic, VMT in the State has continued to increase, reaching a high of over 78.2 billion miles in 2023.



¹³ Federal Highway Administration's (FHWA) Spring 2024 long-term forecast shows total national VMT increasing at an average annual rate of 0.5% between 2019 and 2050 (US FHWA, 2024). Additionally, NJTPA estimates an 11% increase in VMT by 2050 in its 13 county region of NJ (NJTPA, 2021), while the DVRPC estimates that VMT could grow anywhere between -5% to +53% by 2050 in its region which includes parts of PA and DE (DVRPC, 2021).

While increased efficiency of new vehicles will reduce the share of transportation emissions from light-duty vehicles, continued growth in VMT will counter and delay the benefits of energy efficiency gained through transportation electrification by increasing the electricity demand for EV charging. Until New Jersey achieves its 100% clean energy goals, electric vehicles will still produce GHG emissions from charging on an electricity grid that is powered by some portion of fossil fuels. Initiatives that reduce passenger vehicle trips and overall reliance on personal cars and trucks not only provide direct reductions in associated GHG emissions when those vehicles are fossil-fueled but also reduce the total load that electric vehicles place on the electricity grid from charging. While managed charging strategies that shift EV charging to times when there is greater renewable energy availability will be critical in reducing EV demand on the grid, other strategies that reduce the number and length of passenger vehicle trips can further help New Jersey reduce electricity demand and associated emissions in the long term. Additionally, strategies that reduce VMT are less dependent on supply chain markets and the pace of renewable builds or electrification, and several strategies could be implemented in the near term and at relatively lower costs, resulting in early emissions reductions while vehicle electrification and a transition to renewable electricity generation progress.

Policies and initiatives that reduce VMT can also provide co-benefits such as increasing the supply of affordable housing; reducing the cost of housing; improving the energy efficiency of housing; shortening travel distances; reducing time spent in cars; reducing traffic injuries and fatalities; reducing deadly urban heat; increasing access to green space and opportunities for physical activity and recreation; avoiding the conversion of natural lands to development; increasing economic benefits and resident access to services, transit, and employment; and providing improvements to overall quality of life of New Jerseyans. For these reasons, strategies that reduce reliance on light-duty cars and trucks and particularly those that reduce light-duty VMT should play a critical role in New Jersey's efforts to achieve its economy-wide climate goals by 2050.

The CCAP Scenario includes the assumption that statewide light-duty VMT is reduced by at least 3% by 2050. Given that statewide VMT is generally forecasted to increase, New Jersey will need to take additional actions to reverse the trajectory of VMT. While this chapter is not intended to be a comprehensive analysis or plan for how New Jersey should approach reducing statewide VMT, the VMT-related measures New Jersey Department of Environmental Protection (NJDEP) identified in this chapter spotlight transportation-specific strategies that are likely to provide the greatest impact towards achieving the 3% VMT reduction goal. Broader State land use reforms that could be pursued in tandem with these measures to enable greater VMT reductions and associated co-benefits are described in the Wholistic, Cross-sector Approaches Chapter (Chapter 8) of this plan, because they would affect emissions reductions across several GHG emissions sectors (e.g. Transportation, Residential and Commercial Buildings, and Natural Working Lands). The quantification of each VMT-related measure presented below is generally represented by the relative amount of light-duty VMT that could be expected from the measure's implementation. VMT reduction can be viewed as another "no-regrets" policy for New Jersey that is key to managing electricity demand, enhancing the reliability, flexibility, and optionality for the future electricity grid, and providing critical long-term benefits for the State.

Emissions Reduction Measure 1: Continue to implement all current policies and expand current transportation electrification programs

For the transportation sector, the single greatest force that will drive emissions reductions is the transition from fossil fuel vehicles to those powered by clean, renewable electricity. The electric vehicle market has experienced rapid growth in recent years. Globally, EVs are predicted to account for more than a quarter of new sales in 2025, though US adoption is hovering around 8% (IEA, 2025). Federal consumer subsidies of EVs are slated to be phased out at the end of 2025, and this shift in policy is expected to slow US market growth.

Meanwhile, New Jersey continues its work in the vehicle electrification space. Since 2019, the State has provided nearly \$695 million in grants through programs such as the Electric School Bus Grant Program, Diesel Modernization Program,

It Pay\$ to Plug-in, the New Jersey Zero-emission Incentive Program (NJ ZIP), eMobility Grant Program, Charge Up New Jersey, Multi-Unit Dwelling EV Charge Incentive, EV Tourism Grants, and the Clean Fleet EV Incentive Program. These programs have supported:

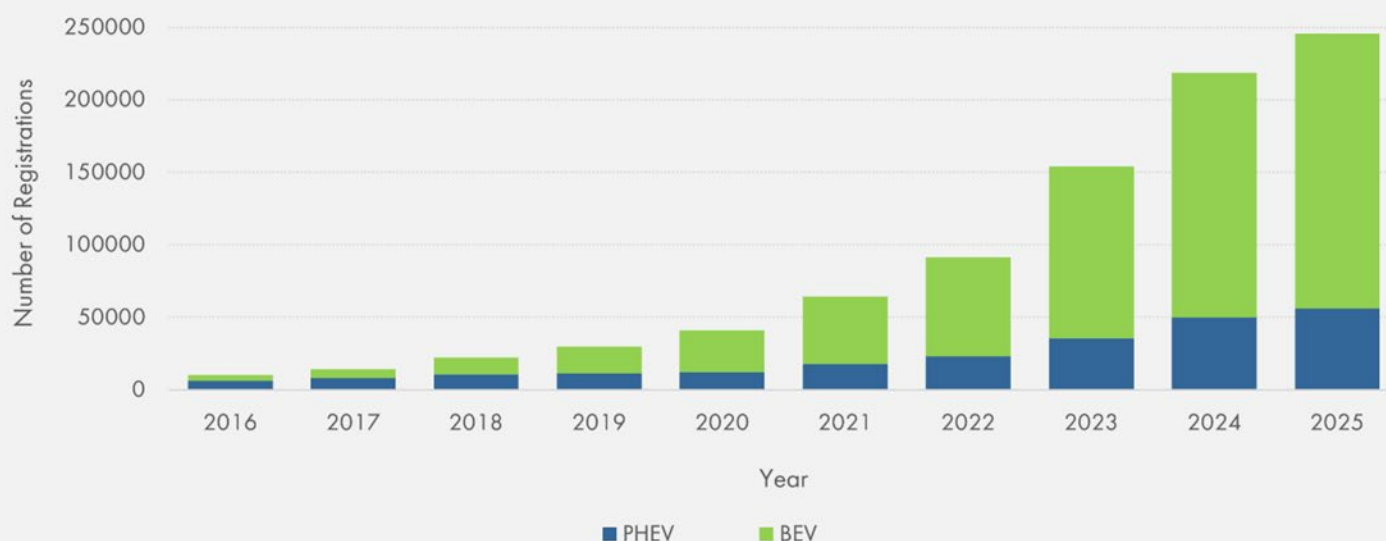
- 58,185 electric vehicles for private or personal use
- 378 electric vehicles for local government
- 7,948 charging stations with 12,437 ports at 1,840 locations
- 10 eMobility projects that will increase access to clean, shared transportation in overburdened communities
- 1,425 electric trucks and cargo vans
- 247 electric school buses and 257 electric buses and shuttle buses
- 328 electric airport, port, and other vehicles and equipment

New Jersey is also leading a \$249 million medium- and heavy-duty zero-emission vehicle charging infrastructure project along the I-95 corridor from Connecticut to Maryland. This effort will complement NJBPU's approximately \$7 million in incentives for medium- and heavy-duty fast charging stations. By continuing to implement and expand upon these programs, as well as the ACC, ACC II, and ACT regulations, the State can work to meet its transportation emissions reduction goals.

These efforts have led the State to continue to see strong EV adoption, with EV's now accounting for 2.97% of registered vehicles in the state, and 13.5% of new vehicle sales. The number of light-duty plug-in electric vehicles (including BEVs and PHEVs) is growing each year, reaching 245,431 registered vehicles in June 2025 (Figure 1.9). Zero-emission vehicle sales reached 1.5% of registered vehicles as of July 2025.

Figure 1.9. Annual plug-in electric vehicle (BEV and PHEV) registrations in New Jersey from 2016 through June 2025.

New Jersey has realized a steady increase in electric vehicle registrations over the last nine years, by June of 2025 the State had 245,431 registered plug-in electric vehicles.



The CCAP Scenario calls for a rapid replacement of on-road gasoline- and diesel- powered vehicles by 2050. Light-duty gasoline vehicles are envisioned as being widely replaced by BEVs and PHEVs, reaching 100% by 2035. Modeling assumed: 60% sales by 2030, with a total of 1.2 million registered EVs; and 100% sales by 2035, with a total of 2.8

million registered EVs. Sales then remain at 100% through 2050, with 6.5 million registered EVs by mid-century (Figure 1.10 and Figure 1.11).¹⁴

Figure 1.10. Light-duty Electric Vehicle Sales (CCAP Scenario).

The CCAP scenario calls for 100% electric light-duty vehicle sales by 2035.

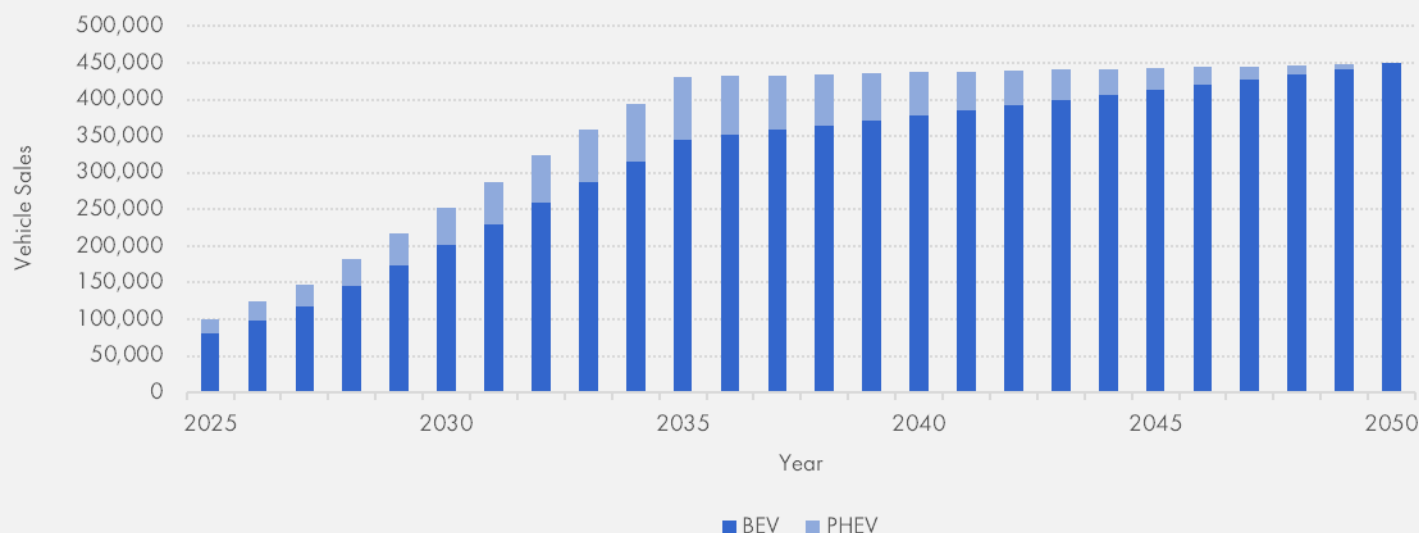
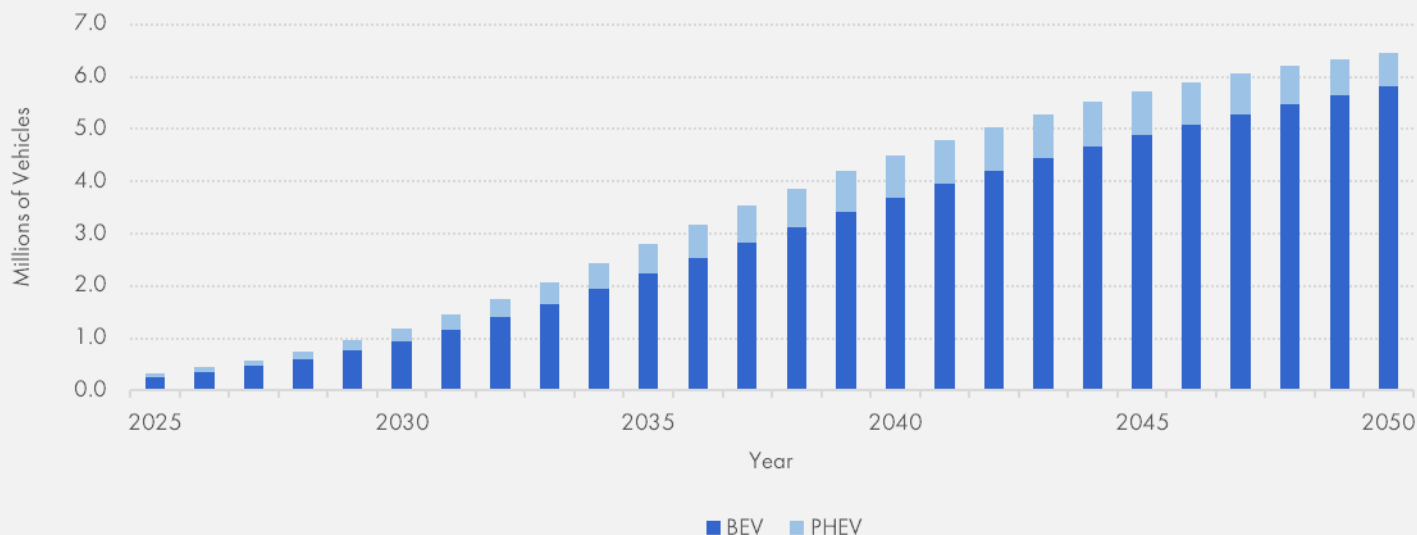


Figure 1.11. Light-duty Electric Vehicle Registrations (CCAP Scenario).

The CCAP scenario models that light-duty electric vehicle registrations will grow substantially, reaching approximately 2.8 million by 2035.



New Jersey's medium- and heavy-duty vehicles are also assumed to rapidly switch to BEVs and FCEVs. The CCAP Scenario assumes medium- and heavy-duty vehicle sales (respectively) as follows: 34% and 48% by 2030, 73% and 82% by 2040; and 100% by 2050 (Figure 1.12).^{15 16} Combined, the CCAP Scenario calls for over 34,000 registered

¹⁴ 2030 sales include 202,000 light-duty BEVs and 58,000 light-duty PHEVs; 2035 sales include 345,000 BEVs and 86,000 PHEVs; 2050 sales include 449,000 BEVs and no PHEVs.

¹⁵ Projected 2030 light medium-duty and medium-duty vehicle sales include 7,100 BEVs and 320 FCEVs. Projected sales for 2040 are 14,000 BEVs and 2,200 FCEVs; and 2050 sales are 20,000 BEVs and 3,100 FCEVs.

¹⁶ Projected 2030 heavy-duty vehicle sales include 2,300 BEVs and no FCEVs; 2040 sales are 3,500 BEVs and 520 FCEVs; and 2050 sales are 4,400 BEVs and 710 FCEVs.

medium- and heavy-duty electric and fuel cell vehicles by 2040, over 179,000 registered by 2040 and over 340,000 by 2050 (Figure 1.13).

Figure 1.12. Medium and Heavy-duty Electric and Fuel Cell Vehicle Sales (CCAP Scenario).
The CCAP scenario calls for 100% electric medium and heavy-duty vehicle sales by 2050.

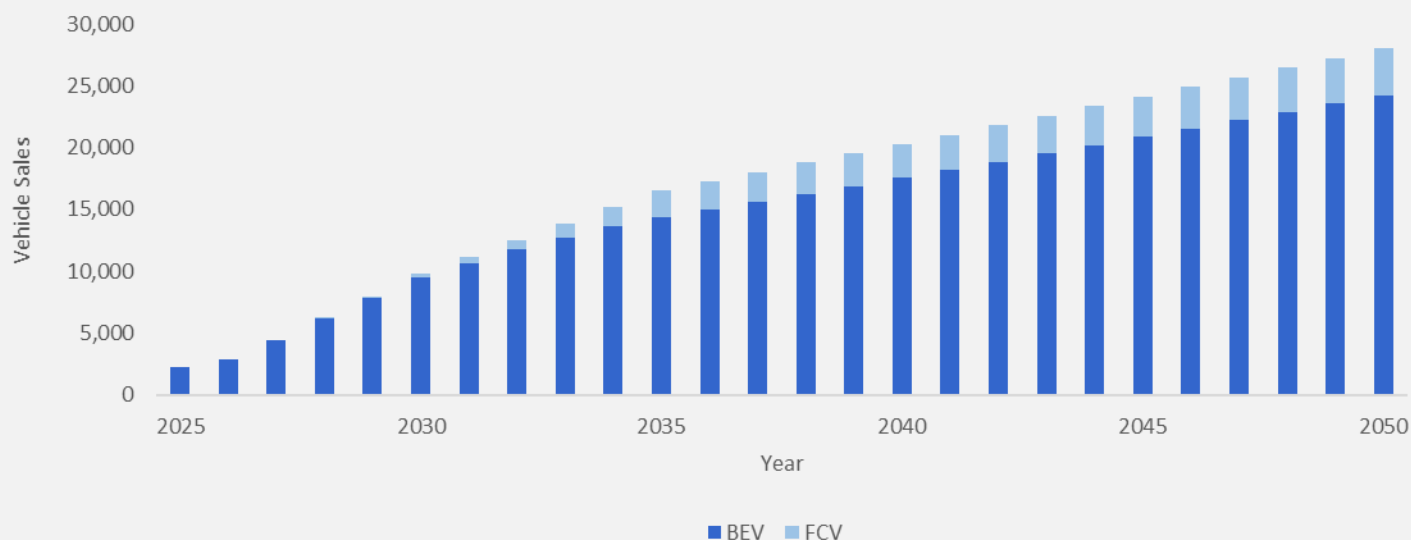
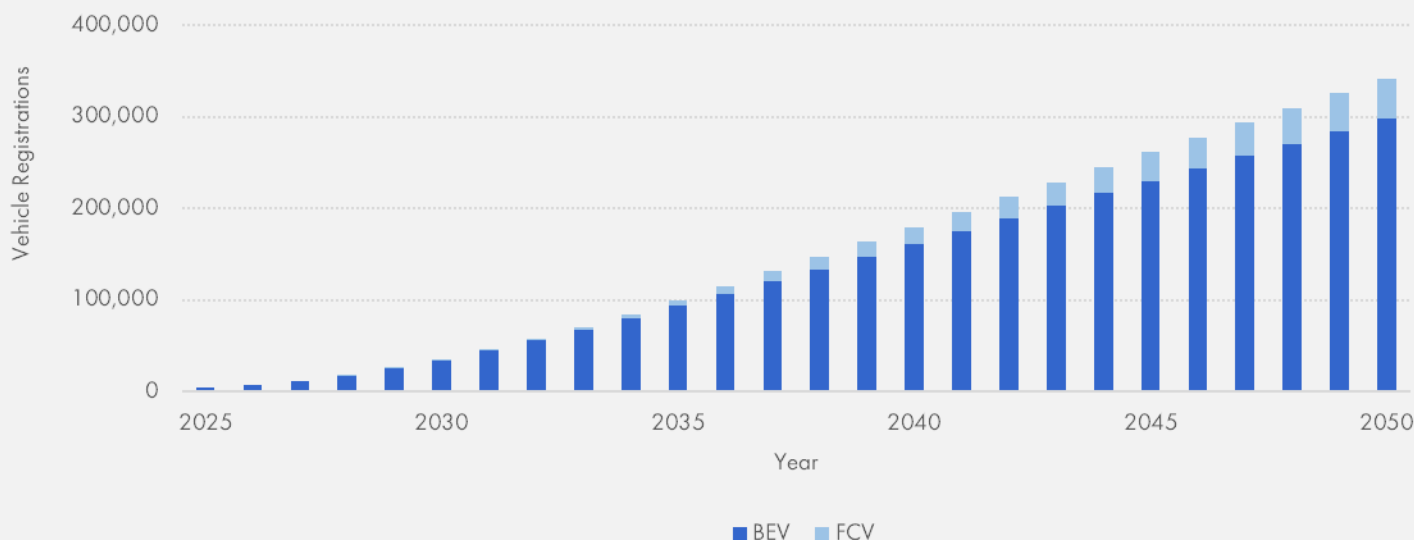


Figure 1.13. Medium and Heavy-duty Electric and Fuel Cell Vehicle Registrations (CCAP Scenario).

The CCAP scenario projects that medium and heavy-duty electric vehicle registrations will grow substantially, with battery electric and fuel cell registrations totaling approximately 99,800 vehicles by 2035.



The increase in adoption of electric vehicles will result in a corresponding increase in demand for electric generation. The 2024 EMP modeling predicted a more than doubling of the state's current electric demand due to electrification across multiple energy sectors, including vehicles and building heating and cooling. To realize the full emissions reduction potential of transportation electrification, the rate of net-zero carbon electric generation must grow proportionately with the increased electric demand created by electric vehicle adoption. This topic is further discussed in the Electricity Generation and Demand Chapter of this plan.

Additionally, non-road vehicles, like cargo handling equipment and forklifts, will need to electrify to meet the state's emissions goals. Although a small portion of the overall emissions mix, these non-road vehicles will be vital to reaching the envisioned full diesel replacement in the transportation space.

Measure Quantification

The majority of emission reductions under current policies are anticipated to come from ACC II and ACT. Emissions reductions from ACC II are projected to reduce New Jersey's annual transportation emissions by 1.7 MMT CO₂e in 2030, 6.8 MMT CO₂e in 2040, and 10.0 MMT CO₂e in 2050 (Figure 1.14). This results in a cumulative 138.0 MMT CO₂e reduced between 2027 and 2050. Additionally, the ACT regulation is projected to reduce the State's annual transportation emissions by 0.6 MMT CO₂e in 2030, 2.59 MMT CO₂e in 2040, and 3.9 MMT CO₂e in 2050 (Figure 1.15). This results in a cumulative 52.2 MMT CO₂e reduced between 2027 and 2050.

Figure 1.14. Annual GHG Emissions Avoided Due to New Jersey ACC II Rule.

New Jersey's implementation of the ACC II Rule will achieve a cumulative GHG emission reduction of 138 MMT CO₂e by 2050.

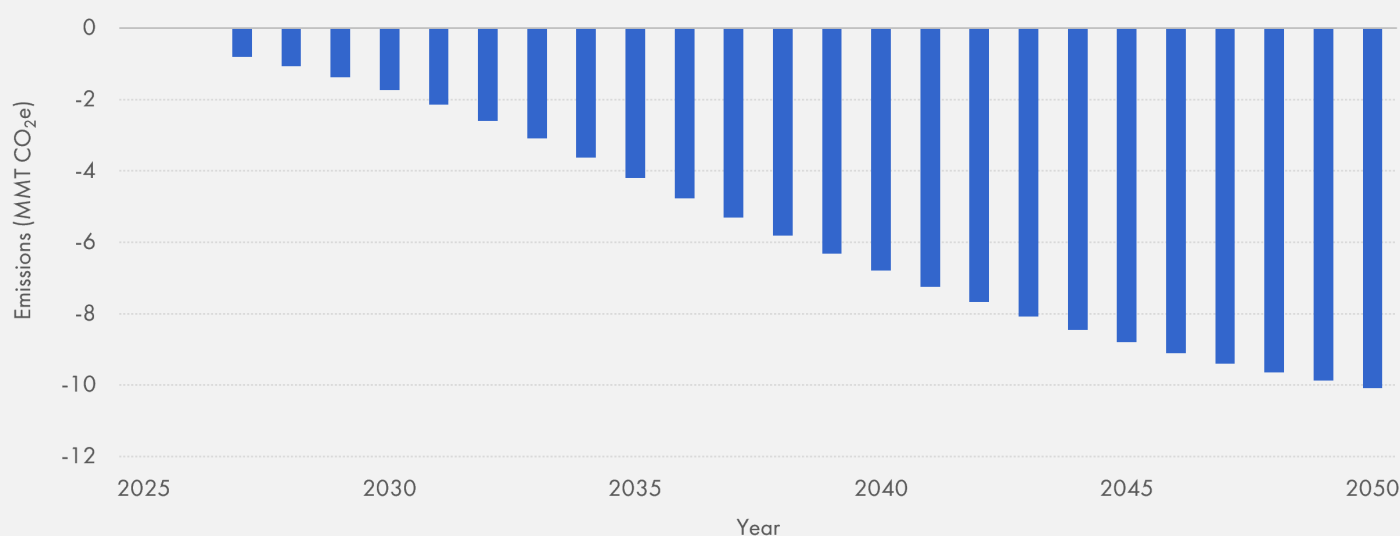
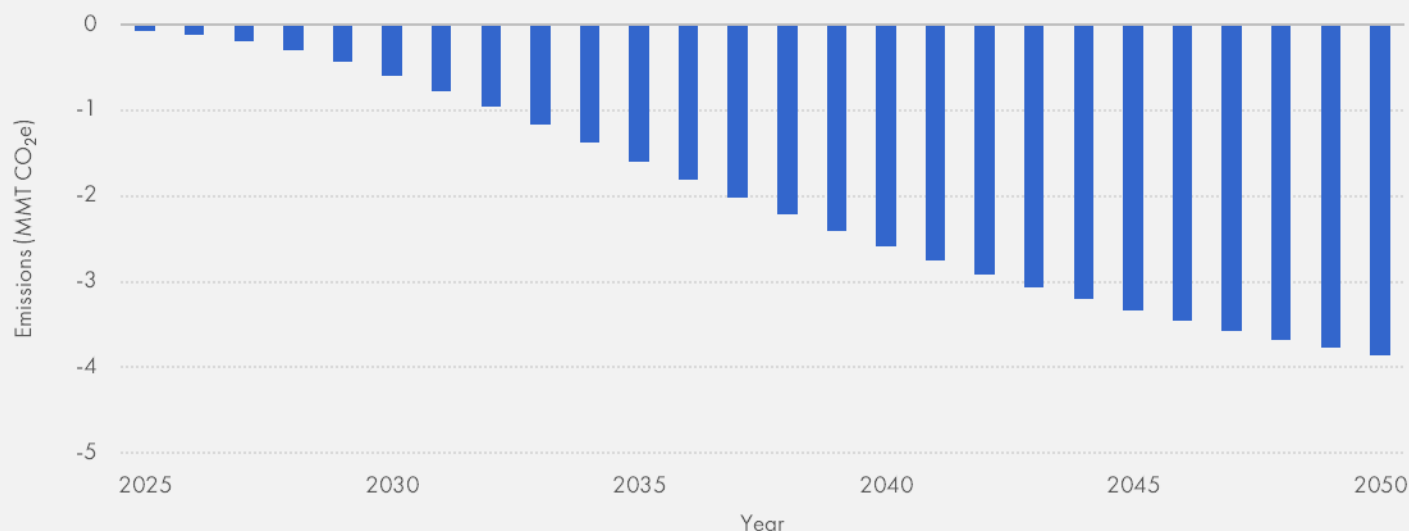


Figure 1.15. Annual GHG Emissions Avoided by the New Jersey ACT Rule.

New Jersey's implementation of the ACT Rule will achieve a cumulative GHG emission reduction of 52.2 MMT CO₂e by 2050.



Priority Enabling Actions

NJDEP has identified nine critical enabling actions to support achievement of Measure 1. These involve implementing existing regulatory programs, expanding the state's charging network and strengthening existing policies.

Enabling Action 1.1 *Implement Advanced Clean Trucks Rule*

In November 2021, the State adopted the Advanced Clean Trucks (N.J.A.C. 7:27-31) regulation, which requires manufacturers of medium- and heavy-duty vehicles to deliver an increasing percentage of zero-emission vehicles. The annual sales requirements, shown in Table 1.3, increase annually through 2035, at which point 55% of Class 2b to 3 vehicles, 75% of Class 4 to 8 straight trucks, and 40% of Class 7 and 8 tractor trailers must be zero-emission.

Table 1.3. Compliance obligations under New Jersey's ACT regulation.

Model Year	Class 2b-3	Class 4-8 Straight Trucks	Class 7-8 Tractors
2025	7%	11%	7%
2026	10%	13%	10%
2027	15%	20%	15%
2028	20%	30%	20%
2029	25%	40%	25%
2030	30%	50%	30%
2031	35%	55%	35%
2032	40%	60%	40%
2033	45%	65%	40%
2034	50%	70%	40%
2035 and beyond	55%	75%	40%

Preliminary data reflects that manufacturers have sold significant numbers of zero-emission trucks into New Jersey, accruing sufficient early action credits for Model Years 2022-2024 to satisfy the industry's overall compliance obligation in Model Year 2025 and also leaving a surplus of credits that can be applied in Model Years 2026-2027. Disruptions in the electric vehicle industry caused by regressive federal policy actions have created significant regulatory uncertainty and considerable concern over tariffs, which adversely impact New Jersey's transition to medium- and heavy-duty zero-emission vehicles. Due to these considerations, NJDEP instituted additional ACT compliance flexibilities for Model Year 2025 (ADMINISTRATIVE ORDER NO. 2025-15, 2025).

Enabling Action 1.2 *Implement Advanced Clean Cars I + II Rules*

New Jersey reaffirmed its commitment to light-duty vehicle electrification by adopting the Advanced Clean Cars II regulation (N.J.A.C. 7:27-29A). This regulation takes effect starting with Model Year 2027 vehicles and increases annually through 2035, at which point 100% of new light-duty vehicle sales must be zero-emission (Table 1.4). The rule is expected to significantly boost EV adoption by ensuring a growing supply of electric vehicles in the State, as the program is correlated with strong EV growth in other states that have adopted the ACC II regulation.

Table 1.4. Compliance obligations under New Jersey's ACC II regulation.

Model Year	Percentage requirement
2027	43
2028	51
2029	59
2030	68
2031	76
2032	82
2033	88
2034	94
2035 and later	100

Enabling Action 1.3 *Implement Policies to Increase the Light-duty EV Sales Share*

New Jersey has made significant progress toward its light-duty plug-in electric vehicle adoption goals with cumulative sales in June 2025 surpassing 245,431 registered vehicles and accounting for 13.5% of new vehicle sales in the state. Programs like Charge Up New Jersey and It Pay\$ to Plug In have successfully driven zero-emission vehicle adoption.

- **Identify and retain a dedicated funding source for light-duty EV incentives.** Having dedicated and reliable incentive funding is an important driver of long-term EV adoption; and New Jersey intends to maintain the \$30 million annual allocation for light-duty EV incentives as required by the EV Law and may consider extending it beyond the 10 year annual allocation until such time as the State has achieved its EV adoption goals.
- **Continue implementing incentive programs for low- and moderate-income communities.** In the next phase of electric vehicle programs, the State may work to adjust the focus of incentives to align with the changing market such as developing incentives for used EVs to make them more affordable for a broader range of buyers. This seeks to expand the state's initial success across a broader population, ensuring that more people, particularly those in low- and moderate-income (LMI) households, can access and afford electric vehicles. NJBPU recently established the Charge Up+ incentive, which allows income-qualifying customers to receive higher incentives for new EVs. Over the next few years, NJBPU may continue to assess the program to understand the State's ongoing needs and consider allocating additional funds or revising incentives based on the level of EV adoption among LMI consumers.
- **Support the electrification of ride-hailing fleets.** In some cases, innovative approaches may be needed to address unique transportation challenges. For example, electric ride-hailing services can be used to transport individuals in rural areas to important services. Over the next few years, the State may consider establishing an incentive structure to support ride-hailing drivers, as well as developing general electrification targets for ride-hailing fleets. Ride-hailing and car-sharing applications can be coupled with public transit and micromobility solutions to further reduce emissions while providing alternative transportation options.
- **Maintain and evolve eMobility grant programs.** Community car-sharing programs can be used to address EV demand in areas with limited charging infrastructure availability and low vehicle ownership rates. NJDEP's eMobility grant program covers a wide variety of shared-use electric vehicle programs, including community carshare and electric ridesharing programs. To date, ten eMobility projects totaling \$18 million have been awarded each tailored to the needs of the community served. To maximize EV exposure in new consumer segments, New Jersey may consider focusing its eMobility grants to prioritize incentives for tougher to reach markets like multi-unit dwellings, overburdened communities, and rural regions.
- **Develop resources to support awareness and acceptance of EVs.** The State is also working to develop additional online resources and tools to support increased consumer and fleet awareness and acceptance of EVs. New Jersey already publishes online resources such as NJDEP's Drive Green website, which highlights EV incentive programs and initiatives. This website is continually expanded and can include features like comparing requirements across programs, detailing how applicants may be able to stack multiple incentives, and identifying which programs are available for residents of different regions of the State or customers of different utilities. This information enables prospective applicants to better understand what options are available for their future purchase. Additionally, in 2022, NJDEP launched a public consumer awareness campaign to educate consumers about the availability and benefits of electric vehicles, which delivered over 70 million impressions. New Jersey is also working to expand upon successful consumer outreach campaigns, such as ride-and-drive events where individuals can test drive EVs, and by developing targeted campaigns for priority stakeholders, including individuals in overburdened and LMI communities. In the last few years, the State has attended over 50 public outreach events and has participated in 19 ride-and-drive events, providing almost 1,400 EV test drives. New Jersey may also develop outreach campaigns focused on fleet operators and expand the existing PlugStar dealer training program and efforts such as the New Jersey EV Sales Certification Course and the PlugStar online tool.

- **Consider non-traditional incentive programs.** Alternative mechanisms for increasing EV adoption may be considered, such as exempting electric vehicles from paying road tolls, allowing free parking, expanding access to high occupancy vehicle lanes, and offering compensation for scrapping fossil fuel vehicles when converting to zero-emission vehicles. The State has a handful of preexisting programs, like the Green Pass Discount, which provides EV drivers with reduced toll rates and access to the Turnpike's high occupancy vehicle lanes during peak hours. No other programs have been proposed to date.
- **Encourage State and local government agencies to lead by example.** State and local governments are also working to lead by example through efforts to electrify their own vehicle fleets. Many State incentive programs are aimed at supporting these efforts including the Clean Fleet Electric Vehicle Incentive Program. Additionally, the State recently awarded a term contract for electric vehicle charging stations which will make it easier for governments to procure charging infrastructure.

Enabling Action 1.4 *Increase Availability of Light-duty Electric Vehicle Charging Infrastructure*

As the share of electric vehicles in New Jersey grows, the demand for charging infrastructure to support these vehicles will also increase. To meet this need, the State is working to build out the charging network to support the expected increase in demand. As of July 2025, the State has over 1,700 public DC Fast Charging ports and more than 3,000 public Level 2 charging ports (Atlas Public Policy , 2025).

- **Continue funding programs to incentivize charging station installations.** To continue supporting this growth, the State has created programs that incentivize the installation of charging stations at multi-unit dwellings, tourism destinations, workplaces, and in publicly accessible locations. These programs are designed to fill in some of the market-driven gaps in the charging network, where the economics of installing chargers are currently not as viable or where site hosts lack the upfront capital to support charging station installation. A prime example of these programs are the ChargeUp New Jersey program which offers incentives for installing charging infrastructure at private residences, and the Multi-unit Dwelling EV Charging Program. These programs provide critical support for residents of overburdened municipalities and help expand electric vehicle charging access. As renters typically lack the ability and capital to install charging stations themselves, this program incentivizes owners of multi-unit dwellings to install charging ports for occupants. Another important State program, "It Pays to Plug In" (NJDEP, It Pays To Plug In, n.d.), provides up to \$4,000 for level 2 charging stations at workplaces, publicly accessible locations, and multi-unit dwellings. Periodically, the program opens for DC fast chargers at corridor locations, community locations, and locations of eMobility projects. These programs target gaps in the market and have helped deploy over 12,400 charging ports in the State thus far.
- **Publish additional resources to support municipalities with installing charging infrastructure.** Financial incentives are not the only policy the State has pursued in building out the passenger vehicle charging network. In 2021, the Department of Consumer Affairs (NJDCA) published the *Model Statewide Municipal EV Ordinance* (NJDCA, 2021) to ensure that municipalities are consistently permitting electric vehicle charging infrastructure and requiring "make-ready" parking spaces.
- **Work with the electric utilities to develop make-ready electric vehicle charging programs.** In September 2020, NJBPU issued an order directing the State's electric utilities to develop programs that deploy make-ready electric vehicle charging infrastructure, which have since been implemented. Those utility programs are still ongoing.
- **Consider establishing additional uptime and accessibility requirements for charging stations.** While the buildout of the public electric vehicle charging network is ongoing, the reliability of that network is still an important aspect to consider. The Governor signed *P.L.2023, c.278* (New Jersey State Code, 2023), which requires publicly funded infrastructure to be operational at least 97% of the time. Over the next five years, the State may assess whether this standard is working as intended or if additional requirements are needed. Beyond regulating uptime, New Jersey may consider incentivizing charging infrastructure reliability by requiring publicly funded projects to include operations and maintenance plans or incentivizing the timely repair of charging infrastructure. Other states have established multi-year operations and maintenance requirements as a condition of receiving grant funding. New Jersey may also adopt performance-based incentive structures, wherein some portion of incentives funds are only awarded if an EV infrastructure project meets specified uptime thresholds.

Enabling Action 1.5 *Implement Policies to Increase the Medium- and Heavy-duty Zero-emission Vehicle Sales Share*

Compared to the passenger vehicle market, electrification of the medium- and heavy-duty vehicle market is more challenging due to higher upfront costs, more significant charging demands, and unique duty cycle requirements. To address challenges with high upfront costs, New Jersey agencies will continue to leverage multiple funding sources including the General Fund, RGGI funds, and federal grant programs.

- **Continue to develop an inventory of medium- and heavy-duty vehicle incentive programs.** Over the next two years, State agencies will continue to inventory medium- and heavy-duty vehicle incentive programs (including forthcoming utility programs); develop websites to showcase and detail program information; examine the need for incentive stacking; and align program eligibility, application, and reporting requirements. Stacking would allow purchasers to take advantage of multiple funding streams, thereby maximizing savings. Aligning eligibility requirements and application procedures would streamline the process of identifying and receiving incentives, thus helping maximize the impact of incentive funds while helping the State plan for broader electrification. These agencies may utilize the information on common challenges to highlight best practices and identify complementary strategies, such as pairing incentives for vehicles with those for charging infrastructure. Pending the results of these analyses, the State may consider launching additional incentive programs or expanding existing programs.
- **Continue funding targeted incentive programs for drayage trucks and school buses.** In certain cases, incentive programs tailored to specific vehicle applications are needed. This includes programs targeting school buses and drayage trucks. The Port Authority of New York and New Jersey (PANYNJ) adopted the Clean Truck requirements, which require any drayage truck that moves shipping containers to and from the Port, and weighing 33,001 pounds or more, to meet certain model year requirements. Additionally, the Port Authority launched a truck replacement program for drayage truck operators who frequently service the ports. While the current program's goal is to modernize the diesel fleet, additional funding could be used to transition to electric trucks. In October 2024, the PANYNJ was awarded \$451 million through the EPA's Clean Ports Program. These funds will help deploy electric drayage trucks with accompanying charging infrastructure, as well as electric cargo handling equipment. PANYNJ also plans to scrap existing vehicles to reduce emissions. On the school bus side, NJDEP's Electric School Bus Grant program helps schools choose more efficient, healthy transportation options by providing up to \$15 M per year for three years to replace diesel school buses with battery electric school buses. The program awarded funds for 53 electric school buses in 2025 and 48 electric school buses in 2024. In the next few years, NJDEP is working to pilot a series of "eco-hubs", which will connect electric school buses to microgrids powered by on-site solar generation, battery storage, and bi-directional school bus charging. This program will seek to understand the potential grid impacts and envision a future vehicle-to-grid framework for the State.
- **Continue to provide technical assistance to support fleet decision-makers.** Fleet decision-makers also face significant challenges in transitioning to zero-emission vehicles due to gaps in knowledge, lack of time to evaluate these technologies, and difficulties engaging outside entities such as utilities, manufacturers, and local permitting authorities. The State will work to engage industry and policy groups to understand the need for policies that would incentivize fleets to adopt zero-emission vehicles without direct financial payment. Technical assistance programs, such as New Jersey Fleet Advisor, address non-financial barriers. These programs support fleet decision-makers in addressing knowledge gaps, helping fleets navigate key decisions around fleet electrification by providing vehicle recommendations, cost projections, on-site infrastructure assessments, and more. These programs help address the non-financial hurdles to electrification and complement the financial programs offered by the State for medium- and heavy-duty vehicle electrification such as NJ ZIP and the Diesel Modernization Program.
- **Consider providing road weight limit exemptions for zero-emission medium- and heavy-duty vehicles.** Another non-financial policy that can help encourage fleet electrification is providing exemptions of up to 2,000 pounds for zero-emission heavy-duty vehicles. The State may consider engaging regional experts to identify the impacts of these weight exemptions on bridges and connector roads. The State would research examples of zero-emission freight exemptions—such as those enacted in California and the European Union—and develop

proposed legislation. This policy would require engagement with neighboring states to consider the potential for zero-emission freight weight exemptions on connected corridors.

Enabling Action 1.6 *Implement Policies to Decarbonize Transit Vehicles*

In 2025, NJ TRANSIT received authorization for the purchase of 260 forty-foot buses and up to 26 zero-emission buses, which marks the final authorization required to have a fully modernized bus fleet by 2031 (NJ TRANSIT, 2025). NJ TRANSIT continues to seek funding to transform its bus fleet to achieve the zero-emission vehicle goals set forth in the 2019 EV Law (New Jersey State Code, 2019).

- **Purchase zero-emission transit buses and upgrade depots to support bus charging.** To date, NJ TRANSIT as received roughly \$105.9 million under the Federal Transit Administration's Low- and No-Emission and Grants for Buses and Bus Facilities programs to purchase battery electric buses and upgrade two NJ TRANSIT depots to support these buses (USDOT, 2024). NJ TRANSIT also received funding under the federal Ride and Drive Electric grant program for a 20-year resilience plan for its electric bus fleet (USDOE, 2025). The agency has an urgent need for additional funding for depot charging powered by solar canopy projects to support their transition to battery electric buses.
- **Electrify Access Link and community transportation vehicles.** NJ TRANSIT's paratransit program, known as Access Link, was established to provide public transportation to people with disabilities who are unable to use the fixed route transit system. NJ TRANSIT will seek funding to expand its efforts to electrify its paratransit service. This began with the fall 2023 purchase of EV paratransit vans for use by Access Link and county community transit providers, and planning assistance to these organizations to pilot the implementation of these vehicles. This work was funded by the Coronavirus Response and Relief Supplemental Appropriations Act flex funds from the North Jersey Transportation Planning Authority. Additional funding is needed to finish electrifying vehicles and local charging infrastructure, along with technical assistance and training for staff managing these routes.
- **Electrify Passenger Rail Engines.** NJ TRANSIT will also continue to seek funding to pursue electrification of its diesel fuel-powered rail engines. For portions of the rail system that do not support catenary wires, NJ TRANSIT is studying how to convert a Dual Power Diesel-Electric locomotive into one that can be propelled by electricity stored in a high-capacity battery, also known as a battery electric locomotive consist. NJ TRANSIT conducted a feasibility study to convert an existing USEPA Tier III ALP-45 dual-power locomotive to a battery electric locomotive consist. The study considered NJ TRANSIT lines which necessitate the need for a dual-power locomotive consist because they traverse both electrified and non-electrified territories. The study concluded that it is feasible to operate a converted battery ALP-45 dual-power locomotive consist on several of NJ TRANSIT's existing routes. Specifically, the North Jersey Coast Line route from Bay Head to Long Branch was found to be an ideal location to pilot this technology.

Enabling Action 1.7 *Increase Availability of Medium- and Heavy-duty Electric Vehicle Charging Infrastructure*

The successful deployment of zero-emission medium- and heavy-duty vehicles is reliant upon the availability of public and private charging and fueling infrastructure. Due to its location, New Jersey is a prominent shipping hub for the Northeastern United States, hosting the PANYNJ. The abundance of freight activity places New Jersey as the fourth highest state in terms of estimated increase in energy demand per area between 2023 and 2030 (Pierre-Louis Ragon, 2023). In 2030, charging medium- and heavy-duty vehicles in New Jersey is expected to require an additional 2,047 MWh daily, requiring an installed nameplate capacity of 1,149 MW of power.

- **Utilize innovative rate design, energy storage, and vehicle-grid-integration to mitigate the impacts of transportation electrification on the electric grid.** Meeting this demand will require significant coordination and investment by the State and electric utilities who will need to update grid infrastructure and utilize new and innovative approaches to reduce the impacts of electric vehicles on the grid. This may include pairing charging stations with on-site renewable energy generation and energy storage or developing provisions for bi-directional charging. Pairing these technology-based solutions with innovative rate-design features for commercial vehicle charging, such as statewide demand charge subscription programs, can additionally help electric vehicles serve

as a grid asset. NJBPU will consider a number of factors for differentiating rates between utilities but may seek to develop a consistent range for fleets operating across multiple utility service territories. Open Charge Point Protocol and interoperability concerns will be prioritized when considering how common charging rates and technologies will apply across utility territories.

- **Partner with utilities to proactively plan for medium- and heavy-duty EV charging infrastructure.** In October 2024, NJBPU adopted minimum filing requirements directing the utilities to propose incentives for make-ready chargers for public-serving fleets and certain private fleets located in or serving overburdened communities adjacent to freight EV corridors. In addition, they provide the framework for proactive planning for public charging stations over 500 kW. The minimum filing requirements additionally require the utilities to create managed charging programs to encourage users to charge at night and help smooth out load over the course of the day. State agencies will continue supporting the utilities as they finalize and release these programs to help promote their use and ensure they are in alignment with the needs of existing incentive programs.
- **Facilitate grid modernization.** In April 2024, the NJBPU announced the approval of a series of grid modernization steps that were developed out of a 2022 strategic report. NJBPU will work to implement short-term goals, such as streamlining utility interconnection application processes, providing more transparent information, and improved assessments of feasibility and costs. The medium- and long-term recommendations will be planned in a series of expert working groups.
- **Develop dedicated charging hubs for medium- and heavy-duty electric vehicles.** While many of the same considerations that apply to light-duty electric vehicle charging apply to electric medium- and heavy-duty vehicle charging, additional considerations like parking space size and power demands differ. Vehicles in Class 4 and above are often too large to fit into typical light-duty vehicle parking spaces and require higher power levels to recharge quickly. It is anticipated that most public charging stations for heavy-duty trucks will require power levels of 350kW or more per port, paired with pull-through charging stalls and ample clearance. To support the public charging needs of medium- and heavy-duty vehicles in New Jersey, private companies have begun investing in charging hubs designed to accommodate medium- and heavy-duty vehicles. To help meet this growing demand, New Jersey has initiated a series of programs aimed at increasing the supply of charging infrastructure for medium- and heavy-duty electric vehicles. New Jersey's P.L. 2023, c.316, was passed in January 2024 and requires the State's Economic Development Authority (EDA) to solicit proposals to determine eligibility for a demonstration program for electric vehicle charging depots. The program will include six depots spread throughout the State and must be serviced by distributed energy resources, such as on-site renewable electric generation, electric storage, demand-response, or energy efficiency measures. Additionally, in conjunction with State agencies from Connecticut, Delaware, and Maryland, NJDEP was awarded \$249 million under the USEPA's CPRG Implementation program to deploy medium- and heavy-duty electric vehicle charging infrastructure along the I-95 corridor and adjacent roads from Connecticut to Maryland. As one of the most densely populated corridors, cutting air pollution from trucks in the I-95 region could improve quality of life for millions of people. These programs are currently in the development phase and will begin implementation over the next few years. During this time, the State will continue to evaluate the demand for and effectiveness of each program to assess whether additional or different funding is needed.

Enabling Action 1.8 *Implement Policies to Increase the Non-road ZEV Sales Share*

Although a majority of New Jersey's transportation emissions come from on-road vehicles, diesel engines in non-road vehicles such as airport ground support equipment, port cargo handling equipment (e.g., gantries, cranes, bulk handling equipment, carriers, stackers, straddlers, etc.), and marine vessels all contribute to emissions in the state. One major contributor to this is the State's ports. The Port Authorities are also responsible for running many of the state's airports, driving many of these emissions.

With the PANYNJ in the North, the South Jersey Port Corporation in the South, and warehouses along the I-95 corridor in between, these non-road engines affect all New Jersey residents, regardless of the distance to the nearest port. Many of these diesel engines have an electric counterpart option to reduce emissions. The PANYNJ has developed a Net Zero Roadmap with a net zero emissions goal by 2050, including the Port's Scope 1, 2, and 3 emissions (PANYNJ, 2024).

In recent years, PANYNJ has won EPA Clean Ports Program grant funding and the PANYNJ and South Jersey Port Corporation have been awarded NJDEP grant funding for non-road diesel replacement projects. NJDEP will continue to support other non-road vehicle fleets who are eligible to apply to the Diesel Modernization Program.

In addition to grant funding, the State is also utilizing regulations to meet its emissions goals. On February 6, 2023, the State adopted the Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yards (N.J.A.C. 7:27-34) regulation which will modernize the oldest diesel-powered equipment at ports and intermodal rail yards (NJDEP, Rule 27, 2023). Port Authorities in New Jersey should continue to convert port equipment to electric options as technology advances, and their one-to-one replacements become more economically profitable. Port tenants and customers can also continue to identify funding projects to support the use of shore power, bulking with alternative fuels, and other lower carbon ways to fuel ships. Although not every ship can be directly electrified, marine vessels bringing cargo from across the world to New Jersey ports can be fueled with lower-emission fuels when in port, using less carbon-intensive fuel types. When maritime transport of passengers is considered, onshore power will be critical to ensure that the ship's diesel engines are not idling to provide the necessities and power for passengers. New Jersey will continue to pilot decarbonization technologies for these vessels and ferries and continue to explore the feasibility of providing electrical hookups when ships are docked.

Generally, the State will continue to be a partner with the Port Authorities, and their associated shippers and receivers, to expand funding and continue to enable the use of alternative fuels for ship bunkering, onshore power for idling ships, and diesel modernization projects for non-road equipment of all types.

Enabling Action 1.9 *Support Workforce Development Efforts Related to Zero-emission Vehicles*

New Jersey can implement workforce development initiatives to help recruit and train technicians needed to maintain EVs and charging infrastructure. New Jersey's Council on the Green Economy was established in 2021 and developed a report defining pathways for green job creation and development of workforce capacity, including in the transportation sector. The 2025 update to this report found that between 2021 and 2023, electric vehicle and electric vehicle charging infrastructure related employment saw a 27% growth rate, reaching over 6,600 jobs in the State. This report further found electricians to be one of the fastest growing sectors for green jobs in the State with an estimated 26% growth in demand between 2022 and 2034/2035, making it an occupation with "severe" needs (NJ Governors Office of Climate Action and the Green Economy, 2025).

- **Expand access to in-state workforce development opportunities.** State agencies are increasingly working to provide equitable economic opportunities by expanding access to job training for the safe installation, testing, and maintenance of charging equipment. These programs aim to increase the availability of qualified electricians, mechanics familiar with electric vehicles, and charging station maintenance and repair technicians. Future workforce development efforts supported by the State may leverage existing resources such as the Electric Vehicle Infrastructure Training Program (EVITP). These strategies can help generate in-state employment opportunities and position New Jersey as a leader in the burgeoning field of zero-emission vehicle workforce development.
- **Leverage grant funding to support workforce development.** As part of NJDEP's CPRG Implementation Grant program, a workforce development component will be implemented which seeks to train 400 workers across the multi-state region to support medium- and heavy-duty vehicle charging hubs. The workforce development program will offer opportunities for residents of overburdened communities and those impacted by the project to receive specialized workforce training with a direct path towards high-quality employment. Workforce training programs will be specifically designed as a first step in opening economic mobility opportunities towards high-quality, sustainable jobs. Support services—such as transportation, childcare, housing, food, technology, and stipends—will be available. Custom-developed curricula and training programs will allow participants to build the skills and knowledge needed to install, maintain, and repair charging equipment, thereby preparing participants for jobs directly needed to deploy medium- and heavy-duty charging infrastructure. This measure will facilitate on-the-job experience that will be applicable to medium- and heavy-duty charging hubs, thereby encouraging job retention and enabling long-term career pathways.

- **Build off existing programs for EV related workforce development.** In 2024, EDA launched a Green Workforce Training Grant Challenge to spur an equitable transition to meaningful green technology employment opportunities. The Green Workforce Training Grant Challenge funded a program that will support electric vehicle-related workforce training, targeting individuals who are re-entering the workforce following their incarceration. The program will provide training in both a classroom and in-person environment and will provide the necessary skills and certifications to properly maintain and repair electric vehicle charging equipment. Trainees are eligible for wraparound services to support their program completion, and once complete, they will have support to help find employment in the sector. The design of the program is made with parity in mind, working with each individual's experience to find pathways into opportunities from entry-level to advanced positions.
- **Support awareness of existing programs for EV related workforce development.** Additionally, New Jersey is working to raise awareness of local and regional workforce training programs, which will help cultivate in-state employment opportunities and develop the workforce needed to support the deployment of EVs and charging infrastructure. New Jersey agencies will continue to explore efforts to promote and expand opportunities for residents to benefit from the job opportunities created by the growing electric vehicle market.

Table 1.5. Measure 1 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Implement the Advanced Clean Trucks rule	Ongoing	NJDEP
Implement the Advanced Clean Cars I + II Rules	Ongoing	NJDEP
Implement Policies to Increase the Light-duty EV Sales Share	Ongoing 100% of state-owned non-emergency light-duty vehicles are plug-in electric vehicles by 2035	All State agencies, Local Governments
Increase Availability of Light-duty Electric Vehicle Charging Infrastructure	Ongoing – Near Term 30% of all multi-family properties are equipped for electric vehicle charging by 2030	NJDEP, NJBPU, NJEDA, NJDCA, Local Governments
Implement Policies to Increase the Medium- and Heavy-duty Zero-emission Vehicle Sales Share	Ongoing until 2030	NJDEP, NJBPU, NJEDA, Local Governments
Implement Policies to Increase the Non-road Zero-emission Vehicle Sales Share	Ongoing	NJDEP, NJBPU, NJEDA, Local Governments
Support Workforce Development Efforts Related to Zero-emission Vehicles	Ongoing	NJDEP, NJEDA, NJDOL
Implement Policies to Decarbonize Transit Vehicles	Near Term 10% of purchases by 2024 50% of purchases by 2026 100% of purchases by 2032	NJ TRANSIT

Increase Availability of Medium- and Heavy-duty Electric Vehicle Charging Infrastructure	Near Term Ongoing until 2030	NJDEP, NJBPU, NJEDA
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Table 1.6. Measure 1 Implementation Approach.

Plan to Leverage Funds
Cost of measure
High
Secured Funding
New Jersey has made significant, ongoing investments in light-duty vehicle electrification via four grant programs: • Charge Up New Jersey • eMobility Grants • It Pay\$ to Plug-in • EV Charging grants for Multi-Unit Dwellings and Tourist Attractions These programs have relied on funding from the Volkswagen Mitigation settlement, auction proceeds from New Jersey's participation in RGGI, Clean Energy Funds, and environmental mitigation settlements. To date, New Jersey has allocated over \$155 million for residents to purchase electric vehicles and charging infrastructure via the Charge Up New Jersey program. Each year, the number of applications for this program exceeds the amount of funding available, indicating a strong, consistent demand for this program. The State's eMobility Grant Program has also allocated \$18M in RGGI funding to bring zero-emission transportation projects to overburdened communities. More recently, under the Federal Charging and Fueling Infrastructure competition, New Jersey was awarded \$10 million to support the deployment of public charging infrastructure near Multi-Unit Dwellings. New Jersey has made significant, ongoing investments to support the transition to zero-emission medium- and heavy-duty vehicles and charging infrastructure, via four primary grant programs: • NJ ZIP • Diesel Fleet Modernization Program • Electric School Bus Grant Program • Medium- and Heavy-duty Electric Vehicle Charging Program These programs have largely relied on funding from the Volkswagen Mitigation settlement and auction proceeds from New Jersey's participation in RGGI. Since 2021, NJ ZIP has allocated \$90 million across two rounds of funding to support commercial, industrial, and institutional organizations in purchasing zero-emission medium- and heavy-duty vehicles. The program has received over \$120 million in requests, indicating significant additional demand. The Diesel Fleet Modernization program has allocated over \$180 million for electric medium- and heavy-duty vehicles replacing older diesel engines in ferries and non-road equipment with newer, more efficient engines. Recent modernization projects include hybrid electric straddle carriers, all-electric yard tractors and forklifts. The program continues to be oversubscribed, indicating additional funding is needed. To date, collectively, New Jersey's electric vehicle programs have allocated nearly \$373 million, including funding for 246 electric light-duty vehicles for local government, 546 electric trucks and cargo vans, 201 electric school buses, and 251 electric buses and shuttle buses. The Clean Corridor Coalition has secured nearly \$250 million to support the buildout of medium- and heavy-duty vehicle charging infrastructure along the I-95 corridor and adjacent roads from Connecticut to Maryland. This will be the first wide-scale funding program to support the deployment of medium- and heavy-duty zero-emission vehicle charging infrastructure in the State. A portion of this funding has been allocated to support workforce development efforts. NJ TRANSIT was awarded \$38 million from the FHWA in September 2023 to support its bus depot electrification efforts, along with \$105.9 million from the Federal Transit Administration's Low- and No-Emission and Grants for Buses and Bus Facilities programs to purchase battery electric buses and upgrade two NJ TRANSIT depots. The agency has also secured funding to via the federal Ride and Drive Electric grant program for a 20-year resilience plan for its electric bus fleet.
Funding Gaps and Opportunities

All enabling actions described in this measure have some amount of funding allocated towards them, however, they would all benefit from additional funds. More funds would allow New Jersey to expand and implement these efforts quicker and on a wider scale, achieving deeper decarbonization.

Geographic Scope

Interstate collaboration is needed. Statewide, including at New Jersey's three airports, 14 seaports, and port-adjacent communities.

Authority to Implement

Subject of further legal review:

NJDEP has broad authority to implement policies and programs to prevent, control, and prohibit air pollution throughout the State, including air contaminants from motor vehicles pursuant to N.J.S.A. 13:1D-9, 26:2C-1 et seq. Further, NJDEP has existing authority to conduct Statewide programs of education pursuant to N.J.S.A. 13:1D-9.

In addition to its broad authority to implement the measures described in this chapter, NJDEP has existing statutory and regulatory authority to implement the ACC, ACC II, and ACT rule at N.J.A.C. 7:27-31. NJDEP's rules are supported by legislation that sets a minimum electric vehicle ownership requirement for the State-owned fleet of light-duty vehicles. See P.L. 2019, c.362. Further, NJDEP has existing authority to implement an Electric School Bus Program (N.J.S.A. 236:2Cc-8.58), while NJ TRANSIT has existing authority to purchase zero-emission vehicles (P.L. 2019, c.362). BPU has the authority to implement light-duty plug-in electric vehicle incentive programs and charging programs (See N.J.S.A. 48:25-4, N.J.S.A. 48:25-6).

Incentive programs for light-duty charging infrastructure could be implemented under the existing authority of NJDEP, NJBPU, and NJEDA. Incentive programs for the electrification of medium- and heavy-duty vehicles and/or charging infrastructure could be implemented under the existing authority of NJDEP, NJBPU, and NJEDA. All municipalities are required to promote the installation of EV charging stations as part of their master plan preparations. See N.J.S.A. 40:55D-28, 40:55D-89 and 40A:12A-7. and 7:27A-3.

Metrics for Tracking Progress

Progress towards this measure will be tracked through vehicle registration data and through required reports submitted under ACT and ACCII. Vehicles funded through State-run programs will be equipped with on-board telematics devices that provide data to evaluate usage and project emissions reductions associated with these programs. The deployment of charging stations is also tracked via a public dashboard [EValueNJ](#).

The State will work with its port authorities to track progress on electrification of drayage trucks, cargo handling equipment, marine vessels, and ferries. Further, NJDEP, via the Cargo Handling Equipment at Ports and Intermodal Rail Yards Rule (N.J.A.C. 7:27-34) requires all regulated businesses at ports and railyards to submit a cargo handling equipment inventory. This data will serve as a baseline.

NJ TRANSIT will track progress as it adds new zero-emission buses and prepares its depots for the coming transition. For actions to electrify services, subrecipients of any grant funding would track usage of fossil vehicles up until point of replacement and compare usage of electric vehicles in service through submission of quarterly maintenance reports.

Emissions Reduction Measure 2: Implement a GHG reduction Planning standard for State and MPO transportation plans

To help New Jersey achieve its climate goals, investments in the State's transportation network need to account for their long-term effects on climate emissions. New Jersey is one of the most densely populated and developed states in the nation and has the highest miles of highway per square mile of any state (NJ OEM, 2019). Transportation system investment decisions are made through State and metropolitan transportation planning processes that occur years before the start of projects and during the development of short-range plans and long-range transportation plans that cover a period of 25 years. Because of this, many transportation projects being constructed today may have been planned a decade or more in the past and do not consider or mitigate the impacts they have on GHGs or New Jersey's climate. Research has found that projects that expand highway capacity in the effort to reduce traffic congestion are not only ineffective after five years, resulting in an *increase* in vehicle travel that is directly proportional to the added capacity, but also result in net increases to on-road transportation GHG emissions (Georgetown Climate Center, 2021). A Georgetown Climate Center and RMI study that looked at state-level impacts from transportation investments of federal Bipartisan Infrastructure Law (BIL) funds found that "relatively modest" New Jersey investments in highway expansion

could more than cancel out the GHG emission reduction benefits from BIL investments in electrification, transit, biking, walking, land use reforms and other strategies by 2040 (Bradbury, Subin, Holland, & Levandowski, 2023) (Levandowski & Bradbury, 2023). This emphasizes that investments made in the State's transportation system today that continue to prioritize travel by personal cars and trucks will have a lasting impact on transportation-related emissions and hinder the State's ability to make progress towards its climate goals. While the Biden Administration's FHWA finalized a rule in 2023 that required state DOTs and metropolitan planning organizations (MPO) to establish declining CO₂ targets, measure and report on progress toward the achievement of those targets, and provide a nationally consistent method for measuring and reporting GHG emissions associated with transportation (Federal Highway Administration, 2021), the Trump Administration repealed this rule in April of 2025. This currently leaves action on linking transportation planning with GHG reductions targets up to states.

New Jersey could ensure that investments in its transportation system do not cause a net increase in on-road transportation emissions or hinder climate gains made through transportation electrification by passing legislation to establish a "GHG Reduction Transportation Planning Standard" or similar requirements following the examples of states like Colorado, Minnesota, California, and Connecticut. This legislation would require future highway projects to account for and mitigate climate emission impacts. New Jersey could model its own standard after Colorado's Senate Bill 21-260 which mandates that transportation capacity expansion projects consider their impact on both VMT and statewide GHG emissions and directs the State's Department of Transportation (DOT) to establish GHG reduction targets for state and regional transportation plans with a compliance deadline (State of Colorado General Assembly, 2021). The law redirects funding to forms of transportation other than driving when State or MPOs transportation modeling shows noncompliance with required GHG emissions reductions. If a New Jersey standard were adopted, it could also set a statewide light-duty VMT reduction target, and similar to Colorado, provide scores for various transportation GHG mitigation measures such as points per bike lane installed in an urban area, points per 1,000 hours of additional transit services offered, as well as equity provisions that give greater scores to projects that propose improvements to communities that have been historically displaced by highway construction or continue to experience disproportionately negative health effects from proximity to highways (Colorado Department of Transportation, 2024). A similar law in Minnesota (HF 2887) requires the State's DOT and MPOs to either redesign or add accompanying mitigation strategies within the region affected to any proposed capacity expansion project that exceeds the State's GHG emission limits, and prioritizes projects that benefit historically disadvantaged communities (TransitCenter, 2023). Other similar laws such as, SB 904 in Connecticut and SB 743 in California require evaluation of the GHG emissions or VMT impacts of proposed projects and either require or support the implementation of mitigation strategies that would address associated emissions from expanding transportation infrastructure (State of Connecticut, 2023) (State of California, 2025).

Measure Quantification

Isolating the 2024 EMP modelled transportation emissions for the relative impact of 3% VMT reduction, provides an estimate of more than 0.237 MMT CO₂e in cumulative direct avoided tailpipe emissions, or over 0.254 MMT CO₂e avoided by 2050 when including upstream electricity emissions associated with reduced vehicle charging (Figure 1.16 and 1.17). This estimate assumes that adopting a GHG transportation planning standard would enable the State to track and implement VMT reductions towards a target goal.

If New Jersey adopted a more aggressive VMT reduction goal of 6%, 12% or 24% by 2050 – aligning with targets set by other states,¹⁷ New Jersey's emissions could be reduced by 0.508 MMT CO₂e; 1.016 MMT CO₂e; and 2.033 MMT CO₂e respectively.¹⁸ All of these estimates, however, do not take into account the upstream emissions from electric or fossil vehicle production or the additional emissions avoided from VMT reduction strategies that would increase the energy efficiency of new buildings and decrease the conversion of natural and working lands through more location-efficient, compact, infill development, which research suggests may provide emissions reductions that are equal to or

¹⁷ This 3% statewide VMT reduction by 2050 is significantly lower than what other states have set as a VMT reduction goals for 2040 or 2050. For example: MN has set a VMT reduction target of 20% by 2050; CA, 30% by 2045; WA, 50% by 2050; DE, 10% by 2030; CT 5% by 2030 (New Jersey Future, 2024). VMT legislation proposed in the State Senate ([S4873](#)) calls for a 8.5% reduction in statewide VMT by 2050 from 2019 levels and directs the New Jersey Motor Vehicle Commission to collect odometer data.

¹⁸ Modeling accounts for both direct emissions avoided and indirect emissions from electricity load reduction.

greater than the direct emissions avoided from reduced driving (Muralidharan, et al., 2024) (Subin, et al., 2024) (Jones, Wheeler, & Kammen, 2018).

Figure 1.16. Annual Emissions Avoided due to VMT Reduction Policies.

The charts show modelled annual GHG emissions avoided associated with a 3% overall reduction in statewide light duty VMT by 2050, assuming a constant annual reduction in LDV emissions from reduced VMT (0.125%/year) starting in 2027, to total a 3% reduction by 2050. Annual avoided emissions from fewer VMT from light duty vehicles are greatest in the short term, because there are more fossil-fueled light duty vehicles on the road than in future years. These estimates also assume New Jersey achieves transportation electrification targets and that 100% of light-duty vehicles sold in the State are zero-emissions by 2035.

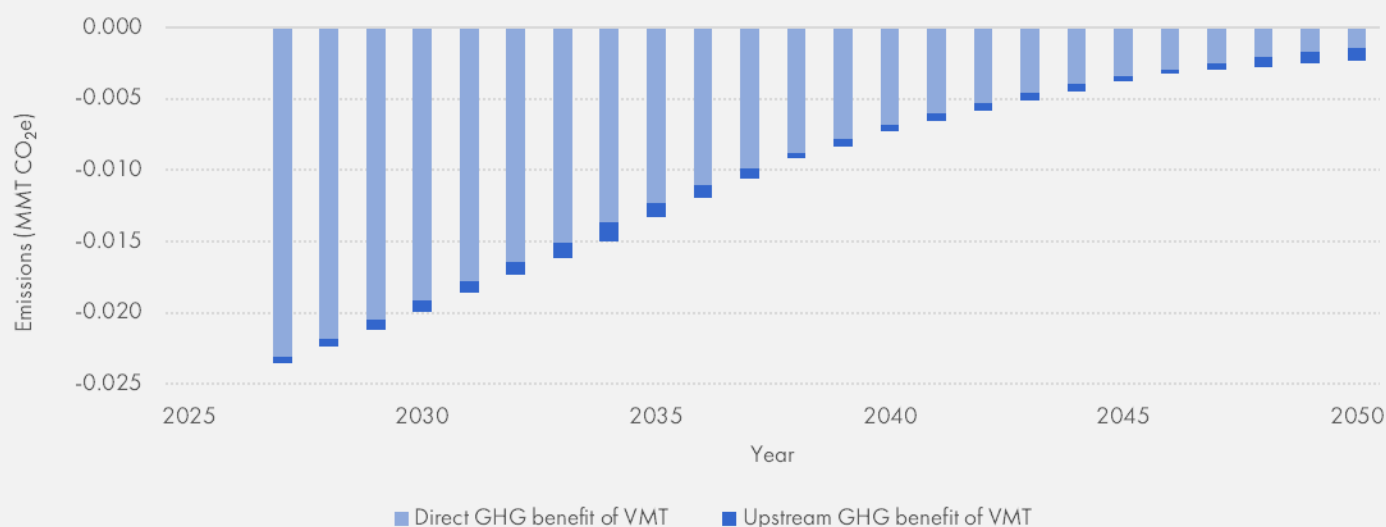
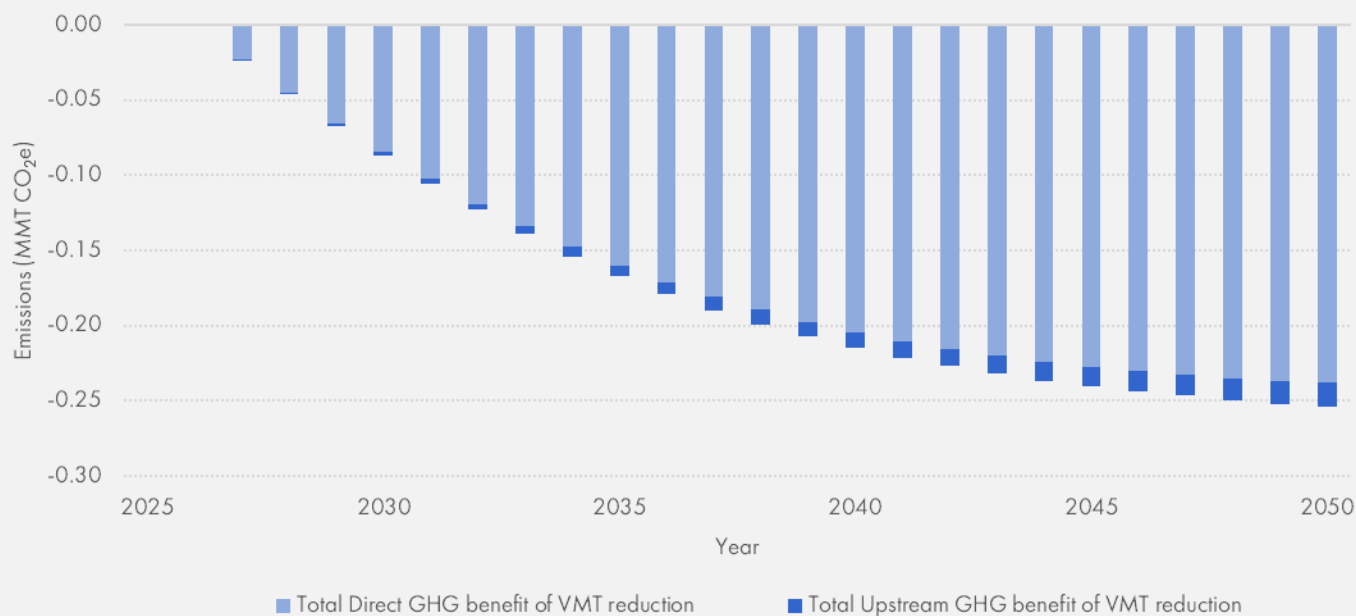


Figure 1.17. Cumulative Emissions Avoided due to VMT Reduction Policies.

Assuming a 3% reduction in VMT in New Jersey, the State could realize a 0.254 MMT CO₂e cumulative reduction by 2050.



Priority Enabling Actions

NJDEP has identified four critical enabling actions to support achievement of Measure 2. These involve revising transportation infrastructure project scoring criteria and selection; pursuing new legislation and corresponding regulations that would require coordination between transportation planning and GHG reduction; setting a statewide VMT reduction target; and creating a commission or technical advisory committee to assess the GHG impacts and support implementation of a transportation planning standard.

Enabling Action 2.1 Revise project scoring criteria to include GHG and/or VMT impacts

Currently, only one of New Jersey's three MPOs (the North Jersey Transportation Planning Authority or NJTPA) requires consideration of a transportation project's GHG impacts and petroleum use in their project scoring criteria and guidance (NJTPA, 2022).¹⁹ While the other MPOs (the Delaware Valley Regional Planning Commission or DVRPC, and South Jersey Transportation Planning Organization or SJTPO) project scoring criteria may consider climate resilience or adaptation implications of a project, climate mitigation implications are not explicitly considered in the evaluation process (DVRPC, 2019) (SJTPO, 2024).²⁰ MPOs could amend their criteria to include and more heavily weight the evaluation of a proposed project's expected net impact on GHG emissions. This could further support the selection of projects that include components such as bicycle and pedestrian facilities, transit, and other transportation alternatives to driving, green designs, low-embodied carbon materials, and overall reduce VMT from baseline or existing conditions. NJDOT is currently in the development stage of integrating GHG emissions assessments into key planning documents in collaboration with agencies such as MPOs, NJ TRANSIT, and the PANYNJ (NJDOT Bureau of Research, Innovation, and Information Transfer, 2024). The agency is also working on calculating GHG emissions reductions, both before and after project implementation, but is seeking FHWA guidance on how to improve the accuracy of these estimates, especially those measuring impacts from individual projects. NJDOT notes that refining GHG forecasting models, standardizing data collection, and establishing data-sharing agreements are needed to effectively integrate assessment of GHGs and reduction targets into transportation planning. While NJDOT can continue to integrate GHG emissions assessments into its own planning documents, it's unclear whether all MPOs are likely to pursue these revisions without a requirement or directive from New Jersey State government. Therefore, effective integration of GHG assessment and reduction targets into transportation planning would likely benefit from legislative or executive action directing and empowering relevant State agencies to address these needs.

Enabling Action 2.2 Pass legislation to require coordination between transportation planning and GHG reduction

Requiring coordination between transportation planning and system investments and the State's efforts to reduce GHG emissions through creation of a GHG transportation planning standard would help further ensure that New Jersey reaches its climate goals in 2050. While there may be other ways to require coordination between transportation system planning and GHG reduction in New Jersey, such as through an Executive Order or revising key planning documents such as project scoring criteria to include consideration of a project's net GHG/ or VMT impact, these strategies alone would not necessarily result in changes to transportation investment decisions or the implementation of measures to offset or mitigate the impact of roadway or highway expansion projects. A GHG transportation planning standard that requires projects to mitigate GHG impacts, would result in more electric vehicles, EV support infrastructure, smart growth land use planning, as well as the development of complete streets, bicycle and pedestrian infrastructure, eMobility, transit and microtransit.

Enabling Action 2.3 Set a statewide light-duty VMT reduction target

New Jersey has not set an official statewide VMT reduction target. At least five other states have set VMT reduction targets and adopted comprehensive measures to achieve those targets (Evans, Sturm, & Weston, 2025).²¹ New Jersey

¹⁹ NJTPA's *TIP Project Scoring Criteria: Project Prioritization Criteria for State and Highway and Bridge Projects*, includes consideration of whether a project will "improve air quality, reduce emissions of Green House Gases (GHGs), and reduce transportation petroleum use," providing up to 25 points for this criterium, out of maximum possible score of 1000. NJTPA is also currently updating their scoring system and is expected complete it in June of 2026.

²⁰ SJTPO's *Project Evaluation Process* adopted in July of 2024, scores a project up to 15 points (out of 100 total) based on the degree the project will "reduce or mitigate on-road mobile source emissions." Though this is not specific to GHG emissions nor does this necessarily require the consideration of a projects net emission impacts.

²¹ These states include Colorado, Connecticut, Minnesota, Oregon, and California. Other states have also set VMT reduction targets.

lawmakers should consider setting a state-wide light-duty VMT reduction target for 2035 and 2050 in statute and requiring VMT data collection through odometer readings during annual vehicle registration. Any New Jersey VMT reduction target should consider baseline VMT and align with the scale of VMT reduction modelled in this plan that will be needed to meet the State's GHG emission targets.

While setting an official VMT target has not been a necessary component to all other states' efforts (including Colorado's) to reduce VMT, doing so in New Jersey and requiring data collection (such as through the NJ Motor Vehicle Commission or NJMVC) would provide State agencies and MPOs responsible for implementing the transportation planning standard with the data necessary to track progress on reducing VMT and a VMT reporting structure that would support enforcement and compliance with the standard. Further, setting a statewide New Jersey VMT target in conjunction with creating a GHG transportation planning standard, would enable the planning standard to act as the mechanism through which the State could effectively track and reduce VMT, thereby ensuring the reduction target is met.

Enabling Action 2.4 *Create a commission or technical advisory committee to assess the GHG impacts, and support implementation of a planning standard*

New Jersey could assemble a commission to study the best approach and design of a GHG reduction transportation planning standard that links GHG impacts to transportation investments. The success of these policies relies on enforcing compliance and developing complementary policies at the State DOT and MPO level. New Jersey's chosen approach may require the creation of a technical advisory committee similar to Minnesota's Transportation Greenhouse Gas Emissions Impact Assessment Technical Advisory Committee which implements provisions of State law (HF 2887) requiring the State's DOT and MPOs to ensure that any proposed capacity expansion projects align with the State's GHG and VMT reduction goals.

Table 1.7. Measure 2 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Revise transportation project scoring criteria to include GHG and/or VMT impacts	Near Term	NJTPA, DVRPC, SJTPO
Pass legislation to require coordination between transportation planning and GHG reduction.	Near Term	Legislature, NJDOT or NJDEP, NJTPA, DVRPC, SJTPO, & NJDOT
Set a statewide light-duty VMT reduction target.	Near Term	Legislature, NJMVC
Create a commission or technical advisory committee to assess the GHG impacts and support implementation of a planning standard	Near Term	Governor's Office or Legislature

Table 1.8. Measure 2 Implementation Approach.

Plan to Leverage Funds
Estimated Cost of Measure
No cost
Secured Funding
While no funding has yet been secured or dedicated to developing a NJ GHG Transportation Planning Standard, NJDOT's Bureau of Research, Innovation and Information Transfer is currently in the process of calculating GHG emission reduction estimates for projects before and after implementation. The agency indicates it is still only in the "Development" stage of innovation in this area, and needs to complete demonstration and assessment before integration of GHG assessment can be institutionalized through NJDOT.

Funding for New Jersey's Transportation Capital Program, which describes planned capital investments, comes from the State Transportation Trust Fund (TTF). Federal funding provides more than half of capital program funding in FY2026 (NJDOT, 2025). The capital program provides funding annually to NJDOT and NJ TRANSIT for "projects and programs that rebuild the State's bridges and roads, provide mass transit services, and reduce congestion by deploying Intelligent Transportation Systems (ITS) technology" (NJDOT, 2025).

Funding Gaps and Opportunities

Enabling actions described in this measure may benefit from additional funds, but are not necessarily a significant driver of implementation. Funding might help New Jersey to expand and implement efforts to integrate GHG assessment into transportation planning quicker and on a wider scale, however, legislative action is likely needed to provide deeper VMT-associated GHG emission reductions.

Enabling actions describe ways New Jersey could tie existing transportation investment funding to GHG reduction.

Geographic Scope

Statewide. Collaboration with Metropolitan Planning Organizations (MPO) will be needed.

Authority to Implement

Subject of further legal review:

The key implementing state agencies will need to obtain authority to implement this measure. Legislative action would be needed.

Metrics for Tracking Progress

Progress towards this measure will be tracked through statewide data on light-duty VMT. If a requirement for VMT data collection is pursued, State agencies and MPOs will be able to review and access more granular VMT data collected as part of annual vehicle registrations through sources such as the NJ Motor Vehicle Commission. This would enable more accurate evaluation of progress towards any VMT reduction goal(s) established.

Emissions Reduction Measure 3: Implement large-scale public transit projects and policies to increase transit ridership

Increasing transit ridership will be a critical piece to meeting the State's climate goals. NJ TRANSIT provides vital transportation services for the State's residents, delivering over 2.6 billion passenger miles of mobility annually (NJ TRANSIT, 2025). With each added passenger, the opportunity exists to reduce reliance on light-duty cars and trucks and thereby reduce GHGs. NJ TRANSIT provided forecasts of the expected growth in passenger train, bus and light rail train ridership through 2050 under low and high ridership scenarios, assuming full implementation of the regional Gateway Program²², and its supporting projects, which is anticipated to provide the majority of the growth in ridership (Table 1.9).

²² <https://www.gatewayprogram.org/aboutgateway.html>

Table 1.9. 2050 Forecasted NJ TRANSIT Ridership Growth and Estimated VMT reductions.

The table below displays forecasted ridership growth rates for NJ TRANSIT from 2025 to 2050, and the estimated light-duty VMT avoided in 2050 from the increased number of transit trips that displace car trips using the American Public Transportation Association (APTA)'s method (APTA, 2019). The high rail estimate, and low bus/LRT estimates assume a full completion of the Gateway Program. Bus and LRT ridership decreases in that scenario as more people divert to the rail system. However, total transit ridership will increase assuming the Gateway scenario.

2025-2050 Forecasted NJ TRANSIT Ridership Growth Rates by Mode	Estimated VMT avoided in 2050 ⁽¹⁾	% reduction of statewide VMT in 2050 ⁽²⁾
Bus - Increase Ridership - Low (30%)	143,941,800	0.19%
<i>Passenger Rail - Increase Ridership - Low (28%)</i>	205,664,816	0.27%
Passenger Light Rail - Increase Ridership - Low (30%)	15,041,880	0.02%
<i>All Transit Modes Ridership Increase - Low</i>	364,648,496	0.48%
 <i>Bus - Increase Ridership High (33%)</i>	 158,335,980	 0.21%
Passenger Rail - Increase Ridership High (59%)	433,365,148	0.58%
<i>Passenger Light Rail - Increase Ridership High (31%)</i>	15,543,276	0.02%
<i>All Transit Modes Ridership Increase - High</i>	607,244,404	0.81%
Total assuming full completion of Gateway	592,348,828	0.79%

Table Notes:

- (1) Baseline passenger miles and trips were based on NJ TRANSIT 2024 At a Glance Factsheet, which provided the most recent/best available figures for the NJ TRANSIT system
- (2) Baseline Statewide VMT utilized the total 2022 on-road light-duty VMT from NJDEP's 2025 Mid-Cycle Update GHG report. This was estimated using EPA's MOVES tool and aligns with VMT figures cited in other parts of this Transportation Chapter.

NJDEP estimates that if NJ TRANSIT ridership increases following the forecasted growth rates associated with full completion of the Gateway Program (see in the table "high" Passenger rail and "low" Light rail and Bus rates), statewide light-duty VMT decreases by about 0.79% in 2050. Unfortunately, this project alone will not achieve the 3% reduction in VMT necessary to realize the CCAP Scenario. Therefore, more policies and actions to both increase transit ridership and reduce light-duty VMT will be needed.

Beyond the Gateway project, NJ TRANSIT ridership growth forecasts also assume the potential completion of some major transit expansion projects by 2050. These projects will enable increased transit ridership and transportation mode-switching from personal vehicles to transit, further facilitating emissions reductions. There may be additional major transit expansion projects over the next 25 years to increase ridership and service by 2050, beyond the major expansion projects highlighted as enabling actions under this measure. Each MPO maintains a list of proposed major future transit expansion projects that are in various stages of planning and development. It takes years and often decades for new transit projects to go from proposals to completed construction. Therefore, it is also critical that New Jersey continue to support and invest in transit system planning that is needed to make more of these expansion projects a reality.

Measure Quantification

NJDEP estimates that cumulative direct emission reductions from fewer on-road light-duty vehicle trips as a result of the most optimal forecasted ridership increases to be 2.73 MMT CO₂e by 2050.²³ The most optimal forecasted

²³ NJDEP's estimate of direct GHG emissions avoided from reduced on-road light-duty VMT following the method in American Public Transportation Association (APTA)'s "Quantifying Greenhouse Gas Emissions from Transit", in which VMT avoided is equal to forecasted increase to passenger miles travelled as a result of the ridership increase multiplied by a mode-shift factor (the ratio of transit passenger miles to displaced. This estimate assumes all new transit trips/rides would be

transit ridership increases assume the potential completion of some major NJ TRANSIT expansion projects, specifically including the full Gateway Program and supporting projects which results in more bus and light-rail riders shifting to NJ TRANSIT commuter rail. The projected reductions in VMT by 2050 also assume there is no overall growth in statewide light-duty VMT from the 2022 baseline.

Priority Enabling Actions

NJDEP has identified 6 critical enabling actions to support achievement of Measure 3. These involve continuing to support and invest in 5 major transit expansion projects in the State that have the potential to reduce VMT through increases in transit ridership. Another critical action is to explore the adoption of other policies to reduce VMT which may include the creation of more bus only lanes, co-location of microtransit²⁴ and micromobility²⁵, service improvements, fare restructuring, and statewide land use reforms that promote or require transit-oriented development.

Enabling Action 3.1 *Continue to support the planning construction and completion of the full Gateway Program and supporting Gateway Projects*

NJ TRANSIT's forecasted ridership growth is closely tied to the successful delivery of the Gateway Program, a multi-phase initiative led by Amtrak and the Gateway Development Commission to replace and expand aging rail infrastructure between New York and New Jersey. The Gateway Program includes construction of new Hudson River tunnels, rehabilitation of the existing tunnels, and replacement of the Portal Bridge.

Equally important for NJ TRANSIT are the Gateway supporting projects across its own system—including yard expansions, replacement of aging movable bridges and other capacity enhancements, construction of flyover tracks, and double-tracking in single-track territory. These investments are essential to enable the additional trains per hour that Gateway will allow to operate into Penn Station New York.

Together, the core Gateway projects, and NJ TRANSIT's supporting investments will unlock substantial new rail capacity not only on the Northeast Corridor, but also across other commuter rail lines. This expanded capacity will enable new or expanded one-seat rides into New York City for riders who today have limited or no direct service. As such, Gateway and its supporting projects are critical enablers of NJ TRANSIT's systemwide ridership growth and New Jersey's broader mobility and climate goals.

replacing gasoline car vehicle trips. This estimate assumes existing bus routes would be sufficient to carry the added passengers, that increased vehicle weight would not significantly reduce energy or fuel efficiency, and that any increase in the number of stops or their duration would be small. Also, this estimate does not include the upstream emissions avoided from reduced EV-related electricity demand or indirect emissions reductions from reduced congestion or land use effects of transit-oriented development (e.g. compact development).

²⁴ Microtransit refers to a technology-enabled service that uses multi-passenger vehicles to provide on-demand services with dynamically generated routing. Microtransit services are usually provided in designated services areas, using provisional pickup and drop-off points within a few minutes' walk of multiple customers. These services require a professional driver, typically employed through a purchased transportation arrangement with a vendor or employed directly by a transit agency.

²⁵ Micromobility refers to fleets of small, low-speed vehicles, primarily used for single-person short trips in urban areas with good connectivity and a density of destinations. It serves as a first and last mile option that is faster than hailing a taxi, walking, or transferring to low-frequency transit. Common forms of micromobility include bikeshare and scootershare, as well as semi-motorized variants of these modes. Typical trips are 1-3 miles, but some trips can be much longer, especially when aided by an electric vehicle.

Figure 1.18. Gateway Program Map.



(Gateway Program Development Commission, 2025)

Enabling Action 3.2 *Continue to plan, construct and make operational the Glassboro-Camden Light Rail (LRT) and South Jersey Bus Rapid Transit (BRT) Projects*

The Glassboro-Camden Line (GCL)²⁶ is a proposed 18-mile passenger rail line restoring passenger rail service between Glassboro and Camden in Southern New Jersey that will offer quick, reliable, frequent service between the communities along the existing Glassboro to Camden rail corridor in Southern New Jersey. Using light rail transit vehicles similar to the NJ TRANSIT River Line, the GCL will focus on increasing mobility and improving links between established communities and activity centers including universities, medical centers and other institutions. At present, connections between these activity centers and the people who access them are not efficient, and travelling along the corridor is difficult.

NJ TRANSIT is also currently evaluating opportunities to advance plans for a complementary South Jersey Bus Rapid Transit ("BRT") System²⁷, through the required federal environmental review process, to further connect communities in Camden and Gloucester counties with downtown Camden and Philadelphia. BRT service will be faster and more reliable than NJ TRANSIT's conventional bus routes, through improvements that separate it from conventional bus and roadway systems such as shoulder-running bus lanes in congested areas and transit signal priority at busy downtown intersections, as well as enhanced customer amenities at stations.

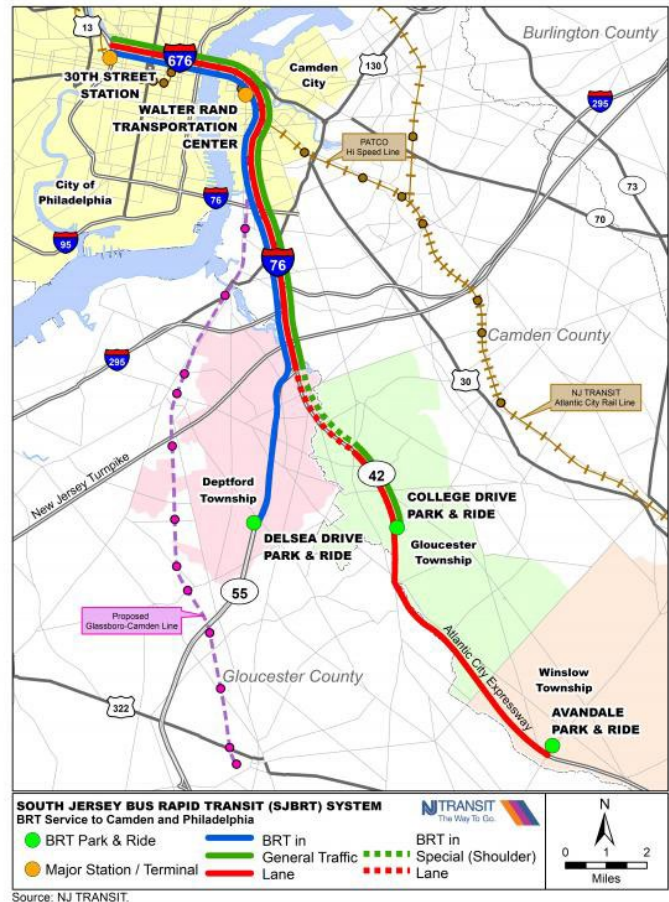
²⁶ <https://glassborocamdenline.com/>

²⁷ <https://www.njtransit.com/sjbrt>



Figure 1.19. Glassboro-Camden Light Rail Transit (LRT) Proposed Route (Left). Using light rail vehicles similar to the NJ TRANSIT River Line, the Glassboro-Camden Line (GCL) would offer quick, reliable, frequent service between the major communities and activity centers. The GCL corridor traverses Gloucester and Camden counties including the communities of Glassboro, Pitman, Sewell, Mantua Twp., Deptford Twp., Wenonah, Woodbury Heights, Woodbury, Westville, Brooklawn, Gloucester City and Camden. Connections will be possible in Camden from the GCL to Philadelphia, Trenton, and more distant points in the region via the PATCO Speedline, the NJ TRANSIT River LINE, and bus. Image source: NJ TRANSIT, 2025.

Figure 1.20 South Jersey Bus Rapid Transit (BRT) Proposed Route (Below). The South Jersey Bus Rapid Transit will serve communities along sections of the Atlantic City Expressway, New Jersey Routes 42 and 55, and Interstates 76 and 676 corridors into downtown Camden and Philadelphia. Image source: NJ TRANSIT, 2025.



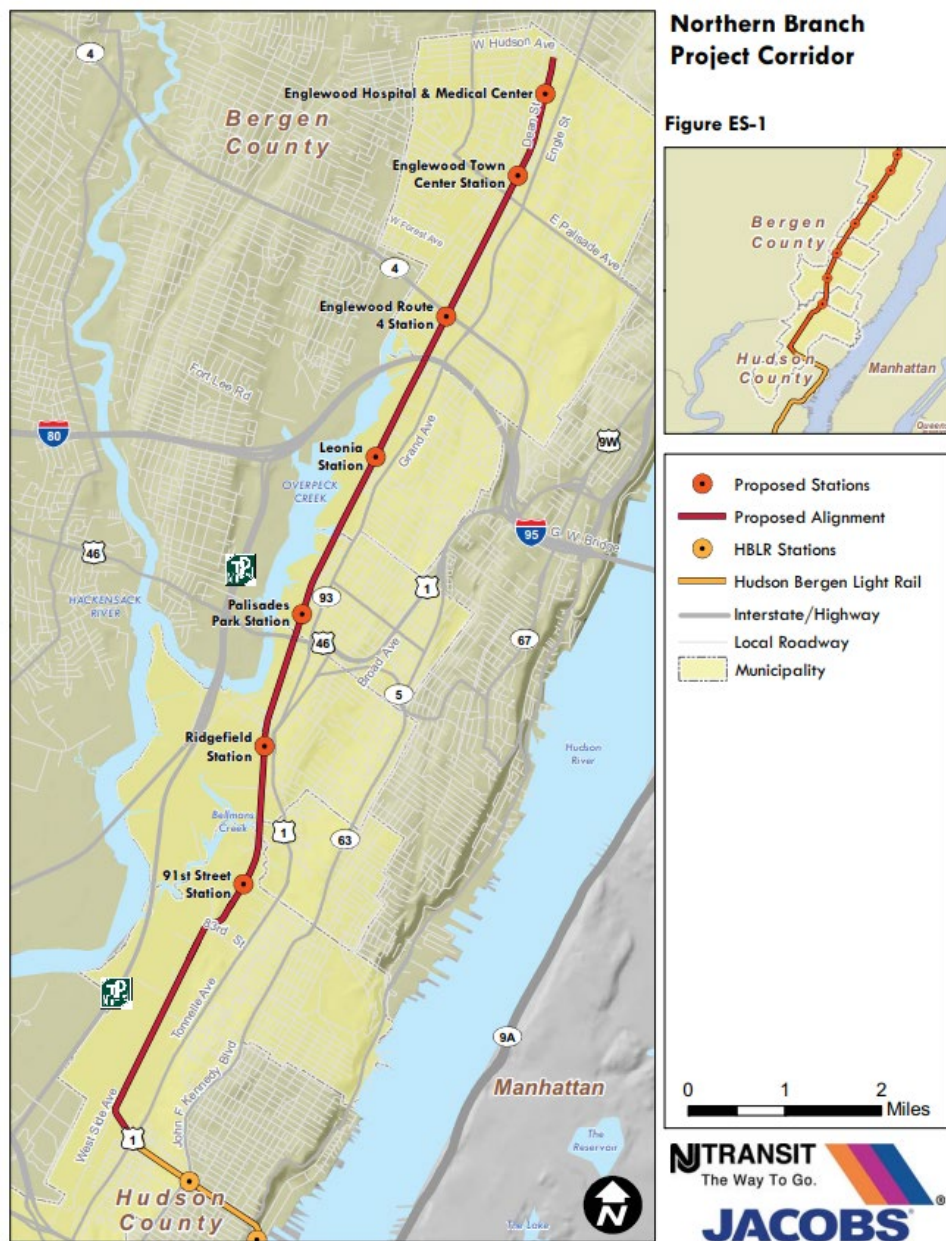
Enabling Action 3.3 Plan, construct and make operational the Hudson-Bergen Light Rail “Northern Branch Corridor” Extension Project

The Hudson-Bergen Light Rail (HBLR) system is in Hudson County, located in northeastern New Jersey. Serving nearly 15 million passenger trips annually, it is NJ TRANSIT’s most used light rail system connecting densely populated cities such as Bayonne, Jersey City, Hoboken, and North Bergen along a 17-mile route with 24 stations. The Northern Branch Corridor Extension²⁸ will expand the HBLR’s reach farther into Bergen County, which is the most densely populated portion of the state, bringing light rail service to communities currently underserved by public transit since passenger rail service was discontinued in the 1950s and 60s. The service will boost access to jobs, schools, healthcare, cultural, and recreational destinations, improving quality of life and fostering stronger community connections, while supporting population and employment growth. The project will also address growing regional

²⁸ <https://www.njtransit.com/northern-branch-corridor-project>

transportation demands and alleviate highway congestion. NJ TRANSIT estimates that this project likely presents the largest potential expansion project, fully within its jurisdiction, for diverting car trips into new transit rides.

Figure 1.21. Hudson-Bergen Light Rail (HBLR) Northern Branch Corridor Extension Proposed Route (Below). *The Northern Branch Extension Project's electric light rail service would operate on West Side Avenue in North Bergen, and then on existing railroad right-of-way owned by CSX Transportation between 91st Street in North Bergen and the northern border of Englewood and would introduce new station stops in North Bergen, Ridgefield, Palisades Park, Leonia, and Englewood. Image Source: NJ TRANSIT, 2025.*



Enabling Action 3.4 *Plan, construct and make operational the Secaucus to Meadowlands (Boonton) Transitway*

NJ TRANSIT is planning and developing designs for a rapid transit system (“Transitway”) between NJ TRANSIT’s existing Secaucus Junction Station and the Meadowlands Sports and Entertainment Complex. NJ TRANSIT plans to leverage existing rights-of-way and partner with adjacent transportation infrastructure owners (such as NJDOT and the New Jersey Transit Authority) to quickly and cost effectively implement environmentally friendly transit access. Additionally, the NJDEP is collaborating with NJ TRANSIT to potentially extend the Secaucus-Meadowlands Transitway into the newly under construction Greenway project adding a dedicated lane for public transit through the future linear state park on the former rail line spanning Essex and Hudson Counties (NJDEP, 2025).



Figure 1.22. Possible Design of Transitway (Left).

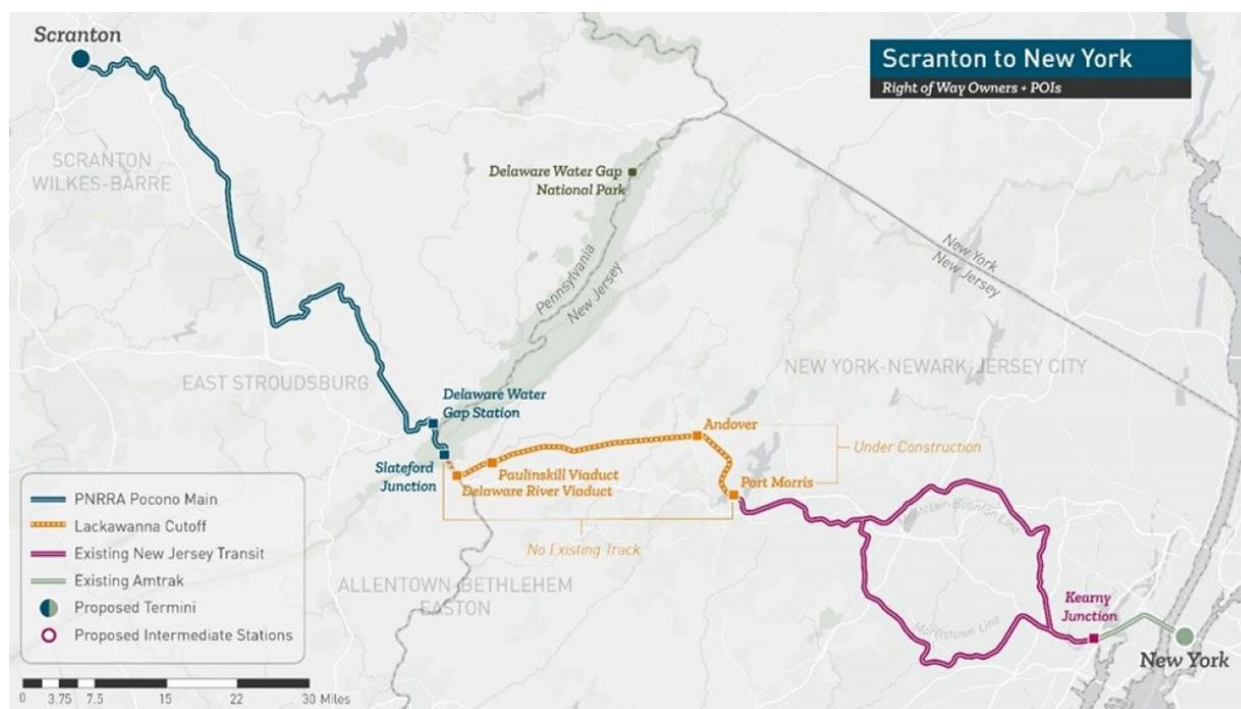
Rendering of the potential transitway extended into the future Greenway. (Image Source: NJDEP, 2025)

Enabling Action 3.5 *Plan, construct and make operational the Lackawanna Cutoff Project*

Currently, NJ TRANSIT is engaged in a project which started in 2011 to reactivate approximately 7.3 miles of service between the Port Morris junction and Andover, which would allow trains to operate through to Hoboken Terminal and/or New York Penn Station. This 7.3 mile portion of the overall project includes a new station at Andover, rehabilitation of the Roseville Tunnel, track and signal, a grade crossing, infrastructure construction, and improvements to the right-of-way, which are covered under the project’s current funding and are currently in progress. Necessary trackwork and stabilization of rail infrastructure around Port Morris is also included.

Beyond Andover, the extension to Scranton is envisioned by AMTRAK, but is uncommitted at this time. Studies to examine the feasibility of an extension from Andover to Scranton have been conducted, and in 2009 the environmental assessment was completed with a “Finding of No Significant Impact”. A study completed in March 2020 analyzed project capital costs for this extension and was sponsored by the Pennsylvania Northeast Regional Rail Authority, which was created to help expedite efforts to restore passenger service on the Pennsylvania side of the project area. The full scope expansion project will provide direct access to a commuter rail system for passengers within Sussex and Warren for travelers trying to avoid highway congestion in the region, thus reducing associated emissions by attracting riders to transit.

Figure 1.23. Lackawanna Cutoff Project Proposed Route (Below). Map of the right of way owners and points of interest along the Lackawanna cutoff proposed route and connection to exiting service. Image Source: PennDOT, 2025.



Enabling Action 3.6 *Explore the adoption of various policies to increase transit ridership*

Beyond expanding transit infrastructure and adding new service routes, the Legislature, NJ TRANSIT and other agencies can consider adopting policies and reforms that will increase ridership on public transit. These policies include, but are not limited to:

- Continuing and expanding investment in transit-oriented development (TOD) and programs that support TOD, walking and bicycling, including exploration of statewide land use reforms.** In 2024, NJ TRANSIT released its updated TOD policy statement which recognizes that walkable, mixed-use development centered around and integrated with transit facilities encourages increased transit ridership. The policy statement sets forth a vision, goals, objectives, and supporting policies that guide development centered around NJ TRANSIT's transportation facilities (NJ TRANSIT, 2024). Since 1999, NJDOT and NJ TRANSIT have spearheaded a multi-agency Smart Growth partnership called the Transit Villages Initiative, which creates incentives for municipalities to redevelop or revitalize areas around transit stations using transit-oriented development design standards. There are currently 35 municipalities that have received a Transit Village designation, which makes them eligible to receive additional grant funding to implement associated TOD-redevelopment projects around transit hubs. In December of 2024, Governor Phil Murphy announced \$2.6 million in FY2025 Transit Village grants to assist eight municipalities in five counties to advance development projects that will improve quality-of-life by revitalizing areas around transit stations and create attractive, vibrant, pedestrian-friendly neighborhoods where people can live, shop, work and play without relying on automobiles (NJDOT, 2024). In order to induce more investments in TOD beyond those communities that voluntarily seek Transit Village designations, New Jersey could consider adopting statewide land use reform similar to Massachusetts' MBTA Communities Program which encourages more compact, 'missing-middle housing' with more walkable neighborhoods by requiring communities to establish at least one zoning district permitting multi-family housing by-right within a half mile of a transit stop and set certain minimum residential density requirements (Commonwealth of Massachusetts, 2025). New Jersey could also consider ways to tie eligibility for existing State-funding sources and grant programs for housing and infrastructure development to

compliance with any new TOD or other compact, location-efficient land use reforms. TOD should be paired with anti-displacement measures. Absent statewide reforms to land use regulations, the State could explore additional incentives and expanded funding for programs that encourage more TOD, including programs that fund complete streets and bicycle and pedestrian infrastructure such as the Local Aid and Economic Development Grants and Local Transportation Project Funds. TOD and compact, mixed-use development also increase opportunities for bicycling and walking trips that can further reduce reliance on cars to meet daily needs.

- **Exploring changes to fare structures and the creation of a “fair fares program.”** NJ TRANSIT already has a reduced fare program for seniors, those with disabilities, and military personnel. New Jersey could explore expanding this program or establishing pilot programs that offer free or discounted transit fares to low- and moderate-income State residents and those in specific groups such as students. Though complex to implement, evaluations of existing programs in other states and metros suggest that changes to transit fare structures or programs that make transit more affordable and accessible to riders, can lead to increased ridership, while improving health outcomes, reducing passenger vehicle emissions and traffic congestion, and increasing demand for transit (Rennert, Samuels, Coffey, & Sumiko Daly, 2025) (Chizeck & Mbonu, 2025). The agency could consider automatic enrollment in these programs, as that has been shown to elicit higher participation and greater positive effects on ridership (Rennert, Samuels, Coffey, & Sumiko Daly, 2025). Exploration of these policies should be accompanied by long-term planning and would need to consider options for filling the associated potential revenue gaps and a robust, targeted marketing campaign. New Jersey could explore pairing free or reduced fare programs with other new sources of revenue such as new roadway congestion or VMT pricing that also increase the costs of driving. New Jersey cities and municipalities could also create their own programs to provide free, or reduced transit fares to residents.
- **Increasing off-peak transit service and adding live-tracking of buses in the NJ TRANSIT app.** Community participants in listening sessions conducted for this plan voiced a desire for expanding public transit bus services to run later into the evening, adding additional stops, and adding real-time trip information technology to the app and at stops. These types of improvements decrease wait times and could lead more people to choose to ride transit instead of taking a personal or rideshare-provided fossil-fueled vehicle to meet their transportation needs. Improvements to service and operations, such as the recent authorization from Governor Phil Murphy to purchase 286 new transit buses, can increase ridership and attract new riders by improving reliability and comfort.
- **Bus-only lanes.** Creating lanes in roadways that are dedicated for transit use can increase the frequency of service and reduce delays, which could lead to more people choosing to ride transit instead of taking a personal or rideshare-provided fossil-fueled vehicle.
- **Co-locating microtransit and eMobility services at existing and planned transit stations and stops.** Most travel trips in New Jersey are made by personal vehicle (Evans, Sturm, & Weston, 2025). Data from the Federal Bureau of Transportation Statistics indicates that more than half of all nationwide vehicle trips in 2021 were less than 3 miles (US Department of Energy, 2022). Sometimes when there is a viable transit route available to get someone most of the way to their destination, a person may opt against taking transit because they do not have a safe or efficient way to travel that first or last mile to their destinations. Providing microtransit or eMobility services as well as improved bicycle or pedestrian infrastructure that allow transit users to safely and efficiently connect from an existing transit stop to their destinations could lead more people to choose transit over driving. “Last Mile” solutions, include the infrastructure, facilities, and operational support for concepts such as bikeshares, scooter shares, or programs similar to the GO Trenton! eMobility pilot project²⁹, that

²⁹ <https://www.gotrenton.org/>

provides on-demand, electric shuttle service connecting people from the transit hub to destinations around town.

Table 1.10. Measure 3 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Continue to support the construction and completion of the full Gateway Program and Supporting Gateway Projects	Ongoing – Mid-Term	Amtrak and The Gateway Development Commission; NJ TRANSIT, Port Authority NY&NJ, MTA, NY Waterway
Continue to plan, construct and make operational the Glassboro-Camden Light Rail and South Jersey Bus Rapid Transit Projects	Ongoing – Near Term	Delaware River Port Authority (DRPA), South Jersey Transportation Planning Organization (SJTPO), NJ TRANSIT
Plan, construct and make operational the Hudson-Bergen Light Rail “Northern Branch Corridor” Extension Project	Ongoing – Near Term	NJ TRANSIT
Plan, construct and make operational the Secaucus to Meadowlands (Boonton) Transitway Project	Ongoing – Near Term	NJ TRANSIT
Plan, construct and make operational the Lackawanna Cutoff Project	Ongoing – Mid-Term	NJ TRANSIT, Amtrak, Pennsylvania Northeast Regional Rail Authority
Explore the adoption of various policies to increase transit ridership	Ongoing	NJ TRANSIT, NJDOT, NJDEP, MPOs, County & Municipal Governments

Table 1.11. Measure 3 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
High
Secured Funding
New Jersey has made significant, ongoing investments in its public transit system through both capital project investments and funding system operational costs. New Jersey has made significant, ongoing investments to facilitate Transit-oriented development around its NJ TRANSIT stations with the support from the follow programs and policies: • Transit Village Program • NJ TRANSIT Transit-Oriented Development Policy Statement • NJ TRANSIT Friendly Planning Program • North Jersey Transportation Planning Authority Emerging Centers Program The following Transit-oriented development projects have been either completed or are forthcoming: • One Thompson Avenue, Dover Station (Completed) • Essex & Crane by Vermella Phase I, Orange Station (Completed) • Somerville Station, Phase I (Completed) • Metropark Transit-Oriented Development, Metropark Station (Under Construction)

- [Hoboken Connect](#), Hoboken Station (Under Construction)
- [Essex & Crane, Phase II By Vermella](#), Orange Station (Under Construction)
- Somerville Station, Phase II (Upcoming)
- The Centre at Red Bank, Red Bank Station (Upcoming)
- The Meridia Downtown Project, Bound Brook Station (Upcoming)

Funding Gaps and Opportunities

A few enabling actions described in this measure have some amount of funding allocated towards them, however, several have not secured funding and they would all benefit from additional funds. More funds would allow New Jersey to expand and implement these efforts quicker and on a wider scale, achieving deeper decarbonization and emissions reductions.

Specifically, NJ TRANSIT will need to secure additional funding for:

- Glassboro-Camden Light Rail (LRT)
- South Jersey Bus Rapid Transit (BRT)
- Secaucus to Meadowlands (Boonton) Transitway
- Lackawanna Cutoff

Geographic Scope

Statewide.

Authority to Implement

Subject of further legal review:

NJ TRANSIT, in direct coordination with the State of New Jersey, is a state-owned public agency responsible for the operation and improvement of a coherent public transportation system in the most efficient and effective manner pursuant N.J.S.A. 27:25 and N.J.A.C. 16:72 through 16:89.

The Gateway Development Commission is a public authority and a government sponsored authority empowered to facilitate and coordinate activities and encourage the actions of others to effectuate the Gateway Program, in particular, Phase 1 of the Gateway Program pursuant the Gateway Development Commission Act.

Metrics for Tracking Progress

NJ TRANSIT tracks annual ridership across the entire system as well as ridership specifically on bus service, light rail, and passenger rail service.

Emissions Reduction Measure 4: Explore new pricing mechanisms and other transportation alternatives that reduce VMT and emissions

As the state transportation system transforms and is electrified, New Jersey will need to further explore the development and implementation of an alternative for gas taxes, such as distance-based user fees, or VMT fees that could replace lost gas tax revenues needed to maintain the state's transportation system infrastructure. New Jersey could also consider other travel demand management strategies which may include congestion pricing in central downtown areas, targeted roadways, or lanes, and parking cash-out programs which change the costs of driving, as well as promoting telework and carpooling.

Measure Quantification

Transportation pricing strategies such as VMT fees and parking pricing may have the largest potential impact on regional light-duty VMT. A USEPA case study found that implementing just a \$0.05-\$0.10/mi price resulted in 3.83%-9.56% decrease in VMT and emissions compared to BAU cases (2020). In the New Jersey 80x50 Report, NJDEP

evaluated different work-from-home scenarios to determine their viability in achieving near and long-term emissions reductions. That evaluation found that a more aggressive work-from-home scenario, where 20% of the state's workforce start to work from home in 2020, increasing to 40% in 2035, and holding steady at 40% through 2050, could reduce cumulative GHG emissions by 161 MMT CO₂e by 2050.

Priority Enabling Measures

NJDEP has identified three critical enabling actions to support achievement of Measure 4. These involve continuing to explore an alternative for the State gas tax that prices on-road transportation based on usage and exploring pairing that with other pricing mechanisms as well as incentives that may influence the costs associated with driving fossil-fueled vehicles such as congestion pricing, parking cash-out, incentives for teleworking, and other strategies that reduce transportation demand.

Enabling Action 4.1 Continue to explore alternatives for the State gas tax, such as a VMT fee

Revenue collected from New Jersey's gas taxes³⁰ currently provide funding for construction and maintenance of roadways, bridges and other transportation infrastructure investments via the Transportation Trust Fund (NJ Treasury Division of Taxation, 2025). As reliance on gasoline for transportation decreases, New Jersey is exploring VMT fees that can act as long-term replacement for the gas-tax. VMT fees are distance-based user fees that charge drivers of passenger vehicles based on the miles they drive on a defined road network (US FHWA, n.d.). In October 2022, NJDOT launched the New Jersey Mileage-Based User Fee (MBUF) Pilot Program, which collected mileage data from participating volunteer New Jersey drivers (NJDOT Bureau of Research, Innovation, and Information Transfer, 2022). The pilot concluded Phase 4 in early 2025 which aimed to study the impacts of a MBUF system specifically on EV drivers (The Eastern Transportation Coalition and NJDOT, 2024). The pilot program study will inform how NJDOT could approach a MBUF as an alternative solution to the gas tax and EV fee³¹ to promote fair contributions to the transportation system (The Eastern Transportation Coalition and NJDOT, 2024). Findings from the MBUF pilot household impact study indicate that rural drivers would actually pay less with a MBUF (The Eastern Transportation Coalition, 2024) (The Eastern Transportation Coalition, 2025) and another study indicates that households could pay less per year on average compared to existing gas tax systems (Rahman, Ju, & Burris, 2025).

A VMT fee or MBUF system may have a larger impact on reducing overall VMT and associated GHG emissions when implemented along with other transportation pricing mechanisms (see enabling action below) and smart growth strategies. 2021 research from the Metropolitan Area Planning Council in Massachusetts that modelled changes in household VMT by 2030 from 2010 levels under different land use and transportation pricing policy scenarios, found that under the continued growth rates and increased urban sprawl scenarios, VMT fees more than halved the overall projected growth in household VMT (Gately & Reardon, 2021). If fees were combined with smart growth land use policies, the growth in VMT was held to just 2.8%, and when applied in tandem with a freeway congestion fee resulted in an almost 20% net reduction in overall household VMT (Gately & Reardon, 2021).

Enabling Action 4.2 Explore other pricing mechanisms such as congestion-pricing and parking cash out incentives

Congestion pricing is a strategy that reduces vehicle congestion and VMT by applying variable prices to roadway usage that shift rush hour roadway travel to other transportation modes (such as transit) or to off-peak periods (US FHWA, 2022). According to the US Federal Highway Administration, congestion pricing is generally recognized by economists as "the single most viable and sustainable approach to managing traffic congestion" (2022). Congestion pricing strategies can involve tolls for specific lanes (such as High-Occupancy Travel or Express lanes), entire roadways, networks or regions. They may also involve applying prices to parking or according to the miles a vehicle is

³⁰ What is generally called the "gas tax" or the "highway fuels tax" is actually two separate taxes on gasoline and diesel fuel - the Motor Fuels Tax (N.J.A.C. 18:18) and the Petroleum Products Gross Receipts Tax (N.J.A.C. 18:18A, N.J.S.A. 54:15B-1 et seq., P.L. 2016, c.57).

³¹ This refers to the annual vehicle registration fee of \$250 for electric vehicles that began in July, 2024.

driven, such as a MBUF. Congestion pricing's effectiveness for reducing VMT and associated emissions has been demonstrated in Europe and the United States. In the first 4 months of New York City Metropolitan Transportation Authority's (MTA) Congestion Relief Zone (also known as the Central Business District Tolling Program), 8.1 million fewer vehicles drove into Manhattan's CBD (NYC MTA, 2025) and the system generated over \$215 million for the transit system (Kaske, 2025). While the program continues to face challenges and opposition, polling suggests that support for the program is increasing (Kaske, 2025). New Jersey State and local governments could explore various types of additional roadway congestion pricing policies for high-volume roadways and centralized downtown areas and study the impact of pricing that exempts or levies lower fees on zero-emission vehicles to align with existing State policies that encourage electric vehicle adoption. NJDOT and NJDEP could work with MPOs to identify new high-impact congestion pricing concepts by locality and could commission feasibility studies in that model the economic and environmental impacts of various proposed structures.

Other pricing policy considerations include increasing parking rates in downtown business districts, using adaptive "smart pricing" to adjust prices in different locations and times based on demand; and restructuring employee parking permits and benefits.

Reducing the number of car work commute trips could be a place to focus efforts as choices to make these trips can be directly influenced by employers, whereas trips made for other purposes may be more difficult to influence. Despite being a national leader in transit-commuting, the vast majority (more than 79%) of New Jersey workers who are not working from home drive to work (US Census Bureau, 2023). The majority of US employers provide free parking for employees at work, but only 9% of employees in the private sector are offered commute benefits for other modes of transportation (U.S. Bureau of Labor Statistics, 2021). In 2019, New Jersey passed the NJ TRANSIT Benefits Law (New Jersey Public Law 2019, Chapter 38, 2019) and became the first state to require employers of at least 20 people to offer pre-tax transportation fringe benefits. New Jersey could expand upon providing pre-tax commuter benefits by exploring parking cash-out (PCO), another pricing mechanism that's been implemented in places like California and Washington DC to reduce VMT by changing the costs associated with driving light-duty fossil fueled passenger vehicles to work. California's 2022 parking cash-out law (California Assembly Bill No. 2206, 2022) requires employers with more than 50 employees that provide parking subsidies to offer employees a cash allowance instead of a parking space (CARB, 2025). According to a FHWA 2023 study, strategies like pre-tax commuter benefits and parking cash out that are designed to make employer-provided commute incentives not favor one transportation mode over another or those designed to disadvantage commute trips where workers drive alone have a significant impact on reducing employee commute trips made by personal vehicle, and that the impact is increased when these strategies are combined (Abou-Zeid, Grant, Heinrich, & Shah, 2023). PCO provides direct benefits to travelers to encourage them to stop driving alone to work. It is considered simpler to administer than other types of commuter incentives and has been found to be more cost-effective than other transportation demand management (TDM) programs, which may make it more politically favorable (Prager, Lu, Membere, & Chhetri, 2024). Beyond adopting PCO legislation, New Jersey could consider incentivizing the creation of PCO programs with employers and municipalities via tax credits or the development of model PCO ordinances. NJDOT and NJDEP could launch a pilot program that supports an initial cohort of volunteer businesses, municipalities, or State agencies to develop and implement PCO pilot programs. The outcomes and lessons learned from the pilots could inform the development of a broader statewide program, model ordinances, or policy changes.

Enabling Action 4.3 *Provide support and incentives for telework and other strategies that reduce transportation demand*

GHG emissions can be reduced through transportation strategies such as working from home, carpooling, and utilizing home delivery services, collectively reducing VMT. Even jobs not conducive to these strategies can realize GHG emissions reductions through the adoption of flexible work hours, reducing the number of weekly commutes and benefiting from improved traffic flow while commuting.

During 2019, about 5% of New Jersey's population worked from home three or more days a week, but about 30% of jobs could be performed from home (Dingel & Neiman, 2020a; Dingel & Neiman, 2020b; US Bureau of Labor Statistics, 2019). US Census Data estimates that the number of workers working-from-home jumped up to 22% in 2021 (likely due to the COVID-19 pandemic) and subsequently declined to 16% and 14% in 2022 and 2023 respectively. NJDEP could expand on the telework analysis from the 80x50 Report and conduct a more thorough analysis of the implications of expanded work-from-home policies on statewide VMT, considering new research, and explore the development of State guidance for employer telework policies.

While recent research has found that teleworking as a strategy alone may not be effective in reducing overall VMT and associated GHGs, teleworking could still have considerable positive environmental impacts when pursued with a suite of VMT reduction strategies that influence travelers' decisions and choices of transportation modes while increasing viability and access to sustainable transportation alternatives, (Tian, Jenkins, & Danton, 2025). Adoption of policies to encourage working from home could therefore lead to cost-effective emissions reductions early in the energy transition process. These strategies can result in immediate, early emissions reductions while vehicle electrification and a transition to renewable electric generation progress. Policies to promote and support teleworking might include tax breaks to companies that enable their employees that can work from home, to work from home at least part of the time. Parking cash out programs may also induce more telework and their requirements should be structured to consider and support teleworking among applicable industries. For instance, businesses that subsidize employee parking may determine that allowing employees to work remotely instead of continuing to subsidize parking spaces or offering a cash value may be more cost effective. PCO programs could exempt employers from providing a cash out for employees that telework 50% or more of the time.

Work-from-home policies also deliver social and environmental benefits beyond their usefulness in reducing GHG emissions (Guyot & Sawhill, 2020). For example, NJDEP analysis of air quality during the spring of 2020 showed significant improvements during the COVID-19 stay at home order. Monthly average nitrogen oxide concentrations measured by NJDEP monitoring stations in urban areas of New Jersey decreased by 31% to 51% in April and May 2020 when compared with monthly average nitrogen oxide concentrations from 2014-2019. Monthly average fine particle (particulate matter of 2.5 microns or smaller, aka PM_{2.5}) levels from the same urban areas decreased 21% to 34% in April and May 2020 when compared to data from 2014-2019. During April 2020, light-duty vehicle traffic volume decreased 50%, and in May decreased about 35% compared to respective light-duty traffic volumes in April and May 2019. Heavy-duty vehicle traffic volume decreased by about 30% for both April and May 2020 when compared with corresponding volumes in 2019 (NJDEP, 2020).

Beyond work-from-home policies, other transportation strategies may provide climate benefits. For example, ride sharing, van pooling and home delivery are also strategies that should be further evaluated for their potential to reduce emissions. Online shopping services have revolutionized commerce in many ways, and efficient delivery of goods can reduce GHG emissions. Local vendors and larger businesses can bring goods and services to neighborhoods further reducing VMT. However, this must be balanced with the need to support stable, prosperous communities that improve quality of life for New Jersey's residents and maintain vibrant downtowns with plentiful work opportunities. A similar consideration is the proliferation of ride hailing services and transportation network (also known as rideshare) companies, which provide residents with convenient transportation in lieu of using a personal vehicle and, in some cases, in lieu of owning a car. These companies can increase mobility especially for those who do not have access to a personal vehicle. Recent research suggests that these services may not provide a net benefit in reducing GHGs, and the VMT and GHG impacts vary depending on geography, the availability of alternative transportation modes, and how dependent residents are on personal vehicles (Martin, Shaheen, & Wolfe, 2024). For example, while rideshare service in urbanized areas with fewer car owners and greater public transit and walkability might shift transit riders and walkers to take more trips by car thereby leading to net increased VMT, rideshares serving more rural areas and communities with greater dependence on car travel may produce a net reduction in VMT. Electric rideshare services may be another way to alleviate some of the potential net GHG emission increases from the net increases in light duty VMT associated with these services. New Jersey could support localized rideshare programs that utilize electric vehicles exclusively (such

as those supported via NJDEP's eMobility program and transportation planning grants) especially in heavily car-dependent areas, as well as policies that incentivize the use of zero-emission vehicles among rideshare companies.

Table 1.12. Measure 4 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Continue to explore alternatives for the State gas tax, such as a VMT fee	Ongoing, Near Term	Legislature, NJDOT
Explore other pricing mechanisms such as congestion-pricing and parking cash out incentives	Complete PCO pilot study – Near Term	NJDOT, NJDEP
	Commission research on TDM pricing options – Near Term	NJDOT, NJDEP, MPOs
	Implement Recommendations from the studies – Midterm	NJDOT, NJ Tolling Authorities (NJTA, NJHA, SJTA)
Provide support and incentives for teleworking and other strategies that reduce transportation demand	Ongoing	NJDEP

Table 1.13. Measure 4 Implementation Approach.

Plan to Leverage Funds
Estimated Cost of Measure
High
Secured Funding
NJ has dedicated funding to complete the NJ MBUF Pilot.
Funding Gaps and Opportunities
NJDOT would need more funds to implement findings of the from the MBUF Pilot or roll out a statewide alternative for the gas tax. New Jersey could utilize the following existing funding sources for studies and plans that support the development and evaluation of pricing mechanisms, parking cash out, teleworking incentives and eMobility projects that reduce light-duty VMT: • NJDEP eMobility Planning Grants • NJ's Regional Greenhouse Gas Initiative (RGGI) Auction Proceeds for administrative costs Additionally, New Jersey could utilize the following funding sources to fund implementation of projects and programs that reduce light-duty VMT through telework, parking cash out, eMobility services; and other strategies: • NJDEP's eMobility Grants • NJ's Regional Greenhouse Gas Initiative (RGGI) Auction Proceeds
Geographic Scope
Statewide.
Authority to Implement
Subject of further legal review:

State agencies must still obtain statutory or regulatory authority to implement the alternative to gas tax or VMT fee action of this measure. Legislative action would likely be needed. With regards to existing roadway pricing, NJ tolling agencies such as the NJ Turnpike Authority, the NJ Highway Authority and the South Jersey Transportation Authority operate specific toll roads and are responsible for setting their own toll rates and increases. NJDOT has the authority to establish and manage toll collection and enforcement on behalf of tolling agencies (N.J.S.A. 27:1A-3.1 (P.L. 2023, c.339)). NJDEP has broad authority to implement policies and programs to prevent, control, and prohibit air pollution throughout the State, including research programs. See N.J.S.A. 13:1D-9, 26:2C-1.

Metrics for Tracking Progress

NJDOT collects statewide VMT annually.

STAKEHOLDER FEEDBACK

In dialogues with community members, advocacy organizations, and other stakeholders, several priorities for reducing emissions from New Jersey's transportation sector arose. Feedback related to measure 1 (continue to implement all current policies and expand current transportation electrification programs) includes the need to expand current financial incentives for electric vehicle adoption such as NJ ZIP and ChargeUp New Jersey, whose funds are currently insufficient to meet demand. Stakeholders recommended investing more funds in these programs with a focus on overburdened communities and fleets, including NJ TRANSIT buses, diesel trucks, police vehicles, school buses, and port equipment/ trucks. The need to expand current electric vehicle charging infrastructure was another key priority, with residents urging the development of charging infrastructure in locations that best serve local residents, rather than travelers. Attendees felt that eMobility solutions can be particularly helpful for connecting people to existing transit hubs and destinations via 'first and last mile' solutions. Some residents pointed out the need to expand zero- and low-carbon transit,

*"There are no footpaths! North Brunswick is divided by Route 1 and another big road. I live a few minutes from the Dunkin' but I would never walk there. **We're really up against this infrastructure that makes it so difficult.**"*

– Community members at the DEP's Climate Action Community Dialogue held in April 2025 commenting on infrastructure that prevents people from walking or biking (rather than driving) to close by destinations.

highlighting concerns over NJ TRANSIT's ongoing diesel bus purchases. Underlying these suggestions was the need to support strategic education programs aimed at both the general public as well as school districts and municipalities in underserved communities.

Feedback related to measure 2 (implement a GHG reduction planning standard for State and MPO transportation plans) includes calls for limiting the expansion of roadways such as the New Jersey Turnpike as well as projects that improve the safety and availability of walking and biking infrastructure through projects such as expanding sidewalks, bike lanes, and pedestrian paths. Attendees across all meetings generally felt that eBikes and scooters would appeal to them more if the roads and infrastructure (like bike lanes) in their communities were safer and more interconnected. Providing financial incentives

for "complete streets" projects and micromobility vehicles like e-bikes and e-scooters is a key component of this, although some participants acknowledged that active transportation may not be feasible for residents of more rural communities or those with mobility impairments.

Feedback related to measure 3 (implement large-scale public transit projects and policies to increase transit ridership) includes the need to support smart growth-type, transit-oriented development, and other land use related projects that reduce emissions from transportation. Transit-related comments include the desire to see expanded transit service areas and more reliable service, particularly in South Jersey. Funding allocated to this measure to date has been insufficient so there is a need to strategically fund technical assistance for local agencies and governments to move conceived projects to "shovel-ready" and to support them in applying for implementation funding. Participants called for transit buses to be electrified, for services to run later into the evening, to add additional stops, and to add real-time trip tracking information on apps and at stops.

Feedback related to measure 4 (explore new pricing mechanisms and other transportation alternatives that reduce VMT and emissions) includes calls for the State to reduce car dependence by adding congestion pricing and limiting the expansion of roadways such as the New Jersey Turnpike.



*"While I believe in micromobility options being a solution, we shouldn't dismiss what still needs to happen with bus electrification... especially school buses. **[Electrification] is happening now, but it needs to happen faster.**"*

– Participant in DEP's Central & South Jersey Climate Action Virtual Community Listening Sessions held in June 2025



*"[eBikes and scooters] appeal to me because people can't afford cars and people have to get to work. People have to get around. **They should have dedicated lanes or sidewalks...** people need to use [eBikes and scooters]."*

– Participant in DEP's Climate Action Community Dialogue held in April 2025.



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RESIDENTIAL & COMMERCIAL BUILDINGS

CHAPTER 2



BUILDINGS SECTOR SNAPSHOT

2022 NJ EMISSIONS ACTIVITIES AND DATA

New Jersey's residential and commercial sector emissions are largely associated with space and water heating, with smaller contributions from cooking and onsite power generation. The buildings sector emitted 25.4 MMT CO₂e in 2022.



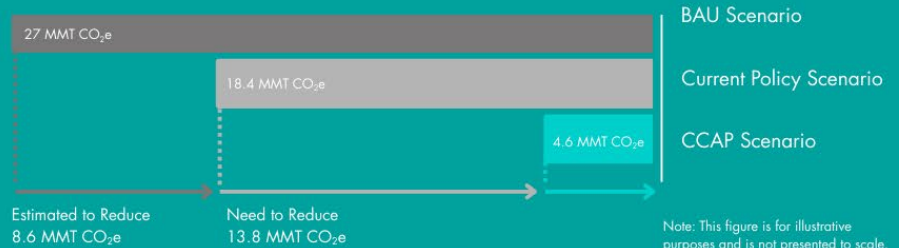
GHGS OF CONCERN

- Carbon Dioxide (CO₂)

EMISSIONS GOAL

4.6 MMT CO₂e

2050 EMISSIONS PROJECTIONS



GHG REDUCTION MEASURES AND ENABLING ACTIONS

Measure 1: Accelerate heat pump installations

- 1.1 Implement and expand upon the NJBPU's Triennial programs
- 1.2 Develop an energy advisor, navigator, or guide for energy customers seeking electrification and energy efficiency improvements
- 1.3 Develop education and outreach materials and training and apprenticeship programs on heat pumps for residential and commercial stakeholders
- 1.4 Work with utilities to launch building decarbonization start up programs and additional demonstration "pilot" projects surrounding thermal energy networks
- 1.5 Develop a renewable heating and cooling web calculator tool for New Jersey
- 1.6 Develop a ground source heat pump tool for New Jersey stakeholders and update the ground source heat pump baseline report
- 1.7 Establish phased pathways for large-scale thermal energy networks, beginning with utility-led pilots and supporting future community-scale deployment
- 1.8 Explore continuation of NJBPU's Higher Education Decarbonization Pilot Program
- 1.9 Phase out programs that incentivize fossil fuel equipment replacements
- 1.10 Require tenant protections for building owner participation in incentive programs
- 1.11 Consider rate reform to encourage electrification and demand flexibility while improving equity
- 1.12 Establish long-term statewide heat pump targets
- 1.13 Implement the Governor's Office Strategic Roadmap for Building Decarbonization and NESCAUM's Multi-State Action Plan
- 1.14 Require heat pump courses in the core curriculum for HVAC contractors pursuing licenses
- 1.15 Catalyze green lending capacity to electrify buildings via New Jersey's Green Bank
- 1.16 Enhance financial incentives for large-scale ground source heat pumps
- 1.17 Form a multistate partnership like the New England Heat Pump Accelerator to advance heat pump adoptions in the Mid-Atlantic region

Measure 2: Adopt a Clean Heat Standard

- 2.1 Establish a heating fuel reporting rule
- 2.2 Evaluate and adopt a Clean Heat Standard
- 2.3 Develop tools to assist with building electrification plans
- 2.4 Expand research and development initiatives for energy efficiency and clean heat technologies
- 2.5 Implement the relevant enabling actions from Measure 1 regarding financing mechanisms to spur further heat pump adoptions

BUILDINGS SECTOR SNAPSHOT CONTINUED

GHG REDUCTION MEASURES AND ENABLING ACTIONS CONTINUED

Measure 3: Upgrade building envelopes

- 3.1 Provide resources to building owners, operators, and occupants to help audit their building's energy usage
- 3.2 Focus on opportunities to increase efficiency in the least efficient buildings, with a focus on low- to moderate-income households
- 3.3 Embed building envelope upgrades in utility programs aimed at electrification and other clean energy technologies
- 3.4 Explore a disclosure or reporting requirement of building energy labeling and energy efficiency at point of sale
- 3.5 Offer targeted programs to enable building envelope and energy efficiency upgrades in low- and moderate-income residential buildings
- 3.6 Continue implementing the NJ COOL Program and RETROFIT NJ Pilot Program

Measure 4: Establish all-electric building codes

- 4.1 Adopt the 2024 International Energy Conservation Code for residential buildings and ASHRAE 90.1-2022 for commercial buildings
- 4.2 Consider adopting an all-electric building code to maximize energy efficiency in new construction
- 4.3 Explore requiring all public housing and State-funded buildings to construct buildings to all-electric standards
- 4.4 Revise the rehabilitation subcode to require major retrofit projects to comply with an all-electric building code
- 4.5 Create guidelines and resources for relevant stakeholders complying with an all-electric building code
- 4.6 Adopt the latest National Electrical Codes
- 4.7 Expand incentives for all-electric appliances and equipment
- 4.8 Mandate energy code courses in the curriculum for licensing programs

Measure 5: Adopt statewide Building Performance Standards

- 5.1 Continue with energy benchmarking efforts and conduct data analysis and research
- 5.2 Evaluate optimal policy designs for a Statewide Building Performance Standard
- 5.3 Adopt a Statewide Building Performance Standard
- 5.4 Develop educational and technical resources to enhance benchmarking and building performance standard compliance

Measure 6: Adopt Zero Emissions Standards for space and water heating

- 6.1 Evaluate and adapt NESCAUM's Zero Emission Heating Equipment Standard Model Rule to New Jersey
- 6.2 Provide financial incentives and tax credits for manufacturers producing zero-carbon emission space and water heaters within the State
- 6.3 Develop technical resources and guidelines for equipment manufacturers, distributors and retailers
- 6.4 Adopt a Clean Heating Procurement requirement for State buildings

Measure 7: Lead by example by decarbonizing State, county and municipal resources

- 7.1 Provide resources to state and local governments to help audit their building's energy usage and achieve energy efficiency and electrification measures
- 7.2 Leverage an interagency taskforce to lead the entirety of the state's building sector transition
- 7.3 Continued Implementation of the State Energy Management Circular that requires State agencies to undergo strategic energy planning
- 7.4 Adapt similar GHG reduction targets to the US DOE Better Climate Challenge
- 7.5 Pilot building decarbonization efforts at State and local government facilities
- 7.6 Expedite implementation of energy conservation measures in State government buildings

OVERVIEW

The residential sector consists of private households, multi-family and apartment buildings, while the commercial sector includes retail space, warehouses, hospitals, senior care facilities, schools, local, State and federal government buildings, religious buildings, universities, and sewage treatment facilities (USEIA, 2025). Recent estimates show that New Jersey has approximately 3.6 million housing units, and over 3.1 billion square feet of commercial floor space.¹ Combined, these sectors are the second largest emitter of greenhouse gases (GHG) in New Jersey after transportation. In 2022, residential and commercial combined emissions totaled 25.4 million metric tons (MMT) carbon dioxide equivalent (CO₂e).

GHGs are emitted by both sectors through “direct” emissions that are produced onsite at the facilities and via “indirect” emissions that occur offsite but are associated with the building sector’s use of electricity. This chapter narrows its focus to direct emissions, which come from the onsite consumption of fossil fuels (e.g., natural gas or fuel oil) for space and water heating, clothes drying and cooking needs (USEPA, 2025a). Indirect emissions² are associated with grid-supplied power consumed for lighting, refrigeration, air conditioning, heating, and other devices and are accounted for under the Electricity Generation and Demand Chapter. Halogenated gas emissions related to consumer products such as refrigerants for air conditioning and other appliances are captured under the Highly Warming Climate Pollutants Chapter, and non-energy emissions from waste and wastewater treatment are captured in the Waste and Agriculture Chapter.

To achieve New Jersey’s 80x50 goal, the residential and commercial sectors will need to phase out fossil fuels and aggressively pursue electrification while introducing energy efficiency measures. Based on the 2024 Energy Master Plan (2024 EMP), if the State is to reach its clean energy and climate goals on time, more than 80% of energy consumed in the residential and commercial sectors in 2050 will need to come from electricity (NJBPU, 2025a).

¹The Number of Residences is based on the National Renewable Energy Laboratory ResStock database. The commercial floor space estimate was based on United States Energy Information Agency (USEIA) Commercial Buildings Energy Consumption Survey (CBECS), allocated to NJ by share of commercial energy consumption from USEIA State Energy Data System (SEDS). Both estimates were used as base assumptions in the 2024 Energy Master Plan modeling.

² Indirect emissions are produced by burning fossil fuel to make electricity, which is then used in residential and commercial activities such as lighting and running appliances (USEPA, 2025a).

WHERE WE STAND

In 2022, the State’s residential and commercial sectors collectively contributed an estimated 25.4 MMT CO₂e towards New Jersey’s net GHG emissions of 97.6 MMT CO₂e (NJDEP, 2025). Natural gas used to heat space and water is responsible for roughly 79% of the 25.4 MMT CO₂e from these sectors; cooking and other applications of natural gas are responsible for approximately 10%; and the remaining 11% is associated with use of fuel oil and propane (USEIA, 2024; USEIA, 2023a; USEIA, 2023b). Many of these activities can be readily converted to electrified alternatives. New Jersey currently estimates emissions from both sectors using fuel consumption data from the United States Energy Information Administration’s State Energy Data System (SEDS).

Residential Buildings

New Jersey’s GHG emissions from the residential sector have remained relatively consistent over time, representing a balance between gradual expansion of housing stock, improving energy efficiency, and fluctuating seasonal demand (Table 2.1). Over the timeframe from 2006 to 2024, New Jersey added 330,000 residences, or about 18,000 units per year (United States Census Bureau, 2012; United States Census Bureau, 2025) and saw an average of 12,000 new natural gas service connections added annually (US Department of Transportation, 2025). This expansion was offset by focused energy efficiency and clean energy programs sponsored by New Jersey Board of Public Utilities (NJBPU), New Jersey Economic Development Authority (NJEDA) and the New Jersey Department of Community Affairs (NJDCA). In particular, NJBPU’s Clean Energy Program, which is comprised of gas and electric energy efficiency and renewable energy efficiency programs, reduced New Jersey’s GHG emissions by about 744,000 metric tons CO₂e in fiscal year 2024 alone.³ Overall, these programs held emissions growth in check to the extent that sector-wide emissions only grew by 1.0 MMT CO₂e between 2006 and 2022.

In 2022, the Residential sector was estimated to release 15.2 million metric tons of CO₂e. This represents 15.6% of New Jersey’s total net emissions.

Table 2.1. Annual Residential Sector Greenhouse Gas Emissions 2005 – 2022 (MMT CO₂e).

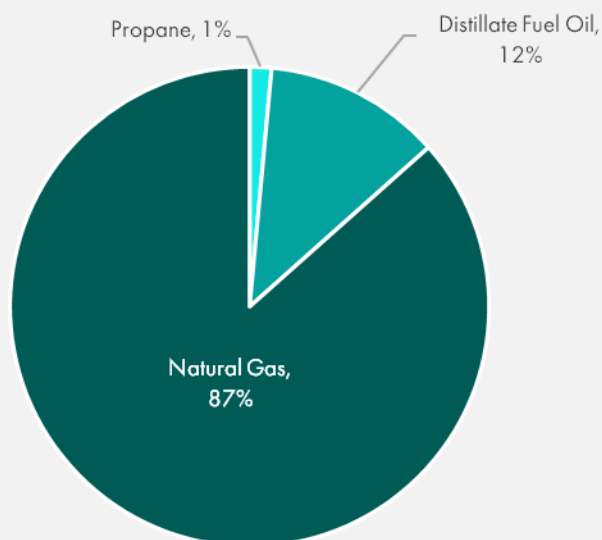
	2005	2006	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
GWP ₁₀₀	16.9	14.2	14.7	16.2	15.6	13.6	13.9	15.8	15.3	14.1	14.9	15.2
GWP ₂₀	17.0	14.2	14.8	16.2	15.6	13.6	13.9	15.8	15.3	14.1	14.9	15.2

Natural gas is by far the largest fossil source of energy in New Jersey homes, providing 90% of the energy and producing 87% of the emissions (Figure 2.1) (USEIA, 2024; USEPA, 2025b). The USEIA’s Residential Energy Consumption Survey (RECS) estimated natural gas end-use in New Jersey residences to be largely for space heating (67%) and water heating (23%) (Figure 2.2) (USEIA, 2023a). The survey also found that New Jersey households are among the five highest consumers of natural gas for residential heating in the country, both in terms of statewide energy consumption and energy consumed per household (USEIA, 2023a). Three out of four New Jersey homes use natural gas as their primary home heating fuel (USEIA, 2023a). The prevalence of natural gas use is linked to the fact that five major interstate gas pipelines crisscross the State and New Jersey’s proximity to Pennsylvania, a well-known source of natural gas.

³ Combined reductions for residential and commercial programs.

Figure 2.1. Residential Emission Sources by Percentage of Total 15.2 MMT CO₂e in 2022.

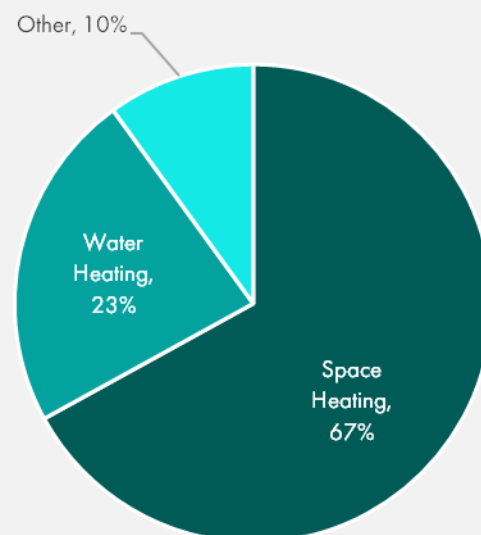
Natural gas was responsible for the greatest proportion of direct emissions from the residential sector, at 87%. Fuel oil contributed an additional 12%, and propane 1%.



(NJDEP, 2025)

Figure 2.2. Natural Gas End Uses in Residential Buildings in New Jersey in 2020.

Combined, space and water heating accounted for 90% of residential natural gas consumption and represented the greatest opportunities for emissions reductions from this sector. Note: 'Other' category includes appliances such as clothes driers and cooktops.



Residential Energy Consumption Survey (USEIA, 2023a)

Commercial Buildings

GHG emissions from the commercial sector remained largely flat from 2005 through 2022, ranging between 9.0 MMT CO₂e to 12.3 MMT CO₂e and experiencing a net gain of 0.7 MMT CO₂e for the period (Table 2.2). As in the residential sector, the commercial sector benefited from energy efficiency programs offered by utilities and the NJBPU's Clean Energy Program. In fiscal year (FY) 2024, 14,226 participants together reduced annual fossil energy demand from all fuels by 388.9 billion British Thermal Units (BTUs) (NJCEP, 2025a).⁴

Table 2.2. Annual Commercial Sector Greenhouse Gas Emissions 2005 – 2022 (MMT CO₂e).

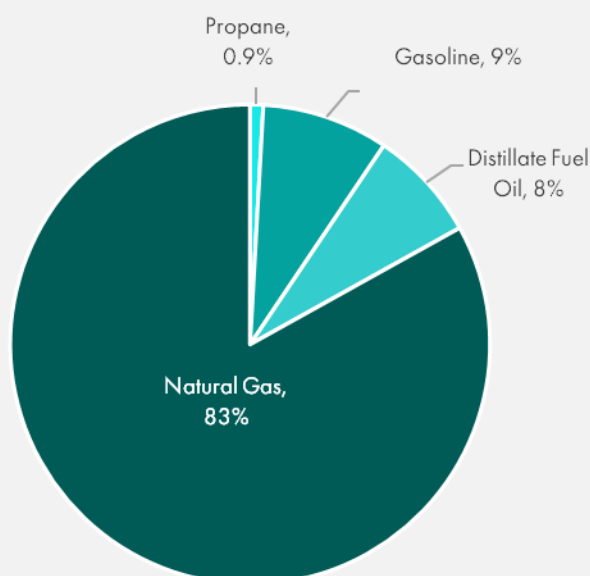
	2005	2006	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
GWP ₁₀₀	11.3	9.6	10.6	12.3	10.7	10.0	9.7	10.7	10.2	9.0	9.9	10.2
GWP ₂₀	11.3	9.6	10.6	12.3	10.8	10.1	9.7	10.7	10.2	9.0	10.0	10.2

⁴ If this energy savings came from reduced natural gas consumption, the total avoided emissions each year would be 20,655 MT CO₂e based on GWP₁₀₀.

In 2022, direct emissions from the commercial sector were primarily attributed to natural gas, distillate fuel oil, and motor gasoline (Figure 2.3) (USEIA, 2024; USEPA, 2025b). For the purposes of energy use calculations, the commercial sector only includes activities such as services that are not involved in actually manufacturing a physical product. As a result, the sector includes government, universities, hospitals, national security sites such as military bases, and sewage treatment facilities, as well as facilities involved with distribution and sales. Common equipment that consumes energy within this sector includes space heating, water heating, cooking, lighting, non-road equipment such as forklifts, and generators to support the activities of the establishments (USEIA, 2025).

Figure 2.3. Sources of Emissions in the Commercial Sector in 2022 as a Percentage of Total 10.2 MMT CO₂e.

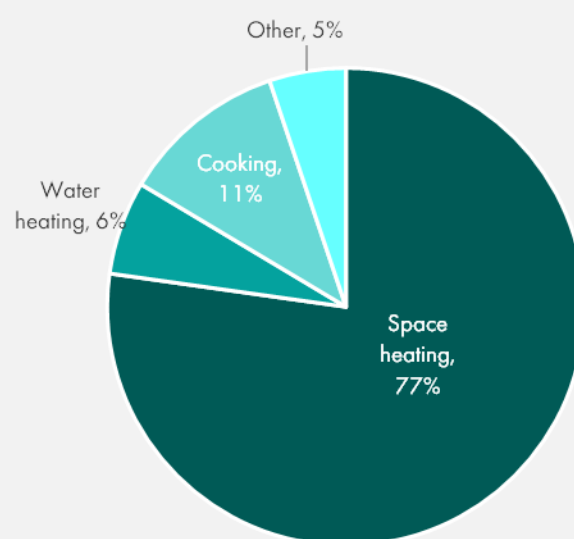
Natural gas has been the largest source of commercial sector emissions since at least 1990. Commercial emissions also include those from fuel oil and gasoline.



(USEIA, 2024; USEPA, 2025a)

Figure 2.4. Natural Gas End Uses in Typical Commercial Buildings in the Mid-Atlantic Region in 2018.

As in the residential sector, space heating is the greatest opportunity for emissions reduction in commercial buildings. Further achievable reductions can be delivered through the electrification of water heating and cooking, and replacement of on-site backup generation with battery storage.



(USEIA, 2023b)

Business-as-Usual Scenario

The Business-as-Usual (BAU) scenario describes the trajectory of GHG emissions from the residential and commercial sector, assuming existing policies are rescinded and there are no new policies, technological breakthroughs, or significant behavioral changes. This baseline scenario projects a future of increasing emissions due to sustained reliance on fossil fuels. The residential and commercial sector BAU assumes the following circumstances:

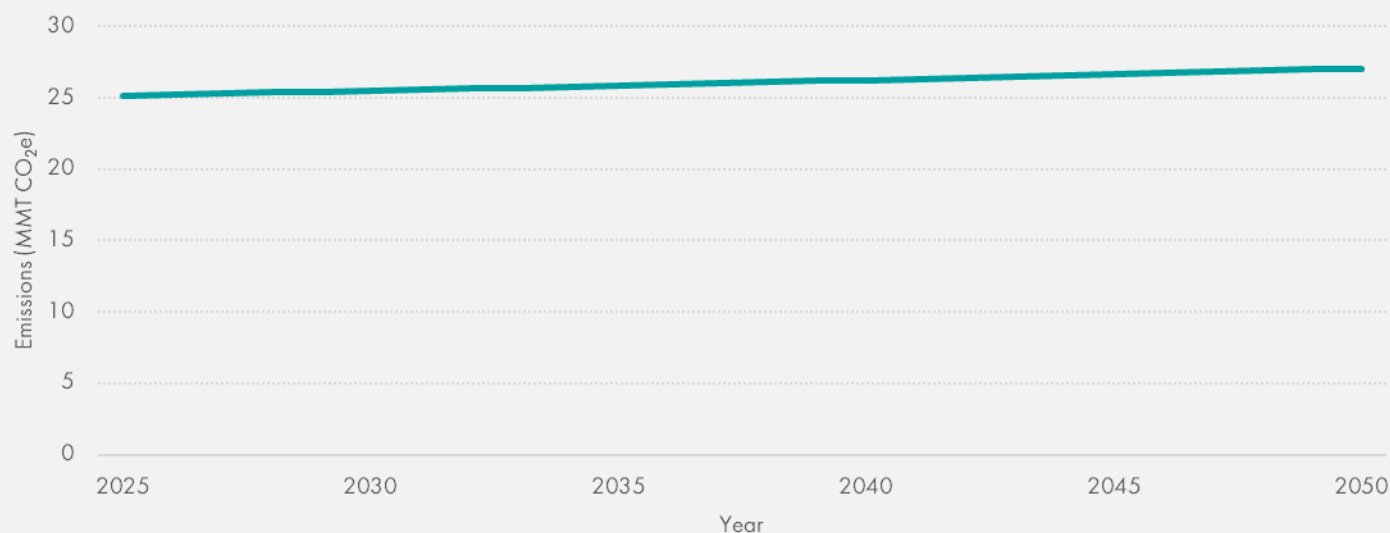
- Residential and commercial heat pump sales shares remain fixed at current levels (4% of sales) through 2050⁵;
- Heat pump water heater sales share remains fixed at current levels (0% for residential and 2% for commercial) through 2050; and
- Few, if any, buildings undergo envelope efficiency upgrades, and building codes are not revised through 2050 (assumes State retains International Energy Conservation Code (IECC) 2018 and American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) 90.1-2-26).

⁵ Residential space heating sales share is broken down by 0% ground source heat pumps, 4% air source heat pumps, 0% hybrid air source heat pumps, 9% electric resistance, and 87% fossil systems. Commercial space heating sales share is broken down by 1% ground source heat pumps, 3% air source heat pumps, 0% hybrid air source heat pumps, 5% electric resistance, and 91% fossil systems.

Under these conditions, combined GHG emissions from the residential and commercial buildings sectors would increase to 27 MMT CO₂e by 2050 (Figure 2.5). Space heating remains the highest source of emissions under the BAU case through 2050.

Figure 2.5 Residential and Commercial Emissions in the BAU Scenario, by Application.

Residential and Commercial Sector emissions are predicted to rise through 2050 under a Business-As-Usual Scenario to 27.0 MMT CO₂e.



Current Policy Scenario

The Current Policy scenario includes all finalized state and federal policies as of May 2024 and assumes continuing growth in the adoption of heat pumps. New Jersey has already implemented several policies in statutes and rules that will promote emissions reductions in the commercial and residential sectors, including adoption of modern building codes, energy efficiency mandates, and promotion of efficient, low emission technologies. The Current Policy Scenario assumes that state and local incentives and building codes will be a large driver of heat pump adoption.⁶ Assumptions include:

- Heat pumps for residential space heating will make up 50% of such sales by 2050, of which about a fifth are hybrid with gas backup;⁷
- Heat pumps for commercial space heating will make up 27% of such sales shares by 2050 as a share of capacity, of which a fifth are hybrid with gas backup;⁸
- Residential heat pump water heaters will make up 64% of such sales by 2050; and
- Commercial heat pump water heaters will make up 18% of such sales by 2050.

Under these circumstances, residential and commercial sector emissions would fall to 18.4 MMT CO₂e by 2050 (Figure 2.6). This outcome would still leave New Jersey 13.8 MMT CO₂e short of achieving its 80x50 emissions reduction goal. Among the modeled sectors, the shortfall in the residential and commercial sectors is the largest and will require not only additional action in these sectors but also increased expansion of clean, renewable energy to support the transition.

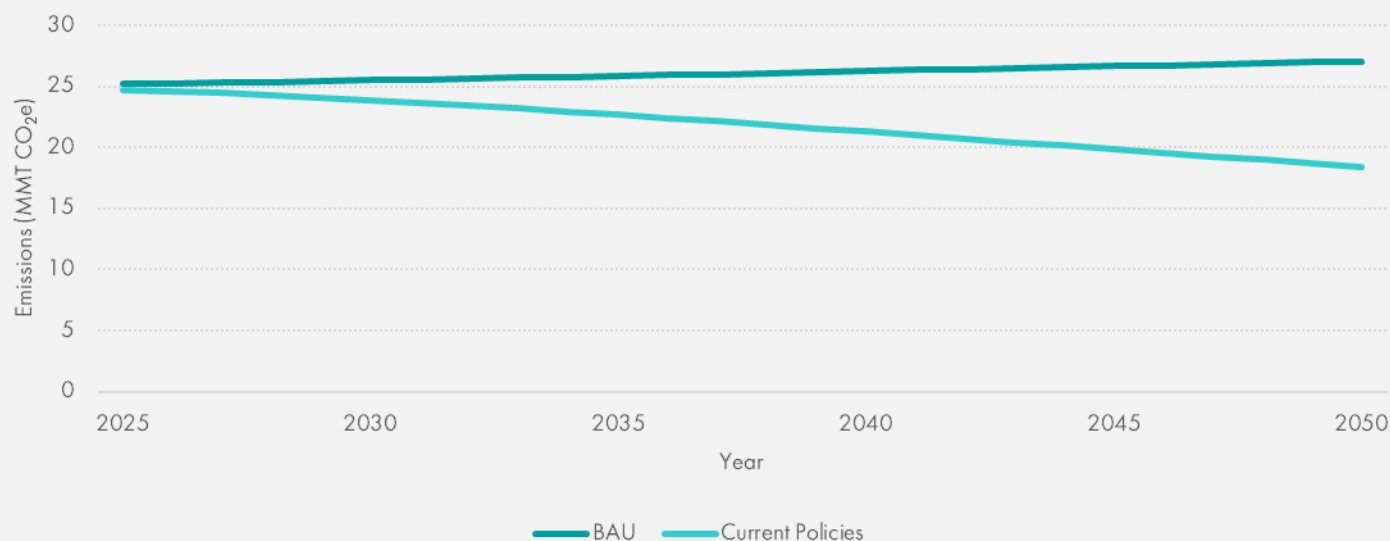
⁶ The Current Policy scenario uses the EPA's Electricity Sector Emissions Impacts of the Inflation Reduction Act Report ([Appendix G.1](#)) to retrieve heat pump sales shares for space and water heating. Using the central projection data for heat pump adoptions, heat pump sales shares data used in the Current Policy scenario were determined based on extending the linear continuation trend through 2030 to 2050 and adjusting the national values to reflect a similar trend in New Jersey.

⁷ Residential space heating sales share in 2050 is broken down by 1% ground source heat pumps, 40% air source heat pumps, 9% hybrid air source heat pumps, 5% electric resistance, and 45% fossil systems.

⁸ Commercial space heating sales share in 2050 is broken down by 2% ground source heat pumps, 21% air source heat pumps, 5% hybrid air source heat pumps, 4% electric resistance, and 68% fossil systems.

Figure 2.6. Residential and Commercial Policy Scenario and Business-As-Usual Scenario, 2020-2050 (MMT CO₂e).

Residential and Commercial Sector emissions are predicted to decline through 2050 under the Current Policy Scenario to 18.4 MMT CO₂e, an 8.6 MMT CO₂e decline compared to the Business-As-Usual Scenario.



Critical Emissions Reduction Policies Adopted Since 2020⁹

New Jersey's state agencies work in tandem to implement policies and subsequent programs and are at the forefront of enhancing emission reductions in the building sector while ensuring it is done equitably for building occupants and energy consumers. The NJBPU reduces emissions in the building sector through the New Jersey Clean Energy Program (NJCEP) and by directing utilities to implement building decarbonization and demand response programs. The NJDEP regulates air emission sources such as appliances, generators, boilers, and process equipment to ensure compliance with emission standards and to minimize their environmental impact. The NJDCA oversees building codes aimed at reducing energy demand and improving energy efficiency in new and existing construction.

Further helping with the transition to building electrification and efficiency, State legislation continues to enable coordinated implementation efforts across State agencies, spurring market developments and driving new innovations to meet the State's building electrification needs. Considered one driving force behind the advancement of renewable energy, energy efficiency, and energy storage policies and programs in the State, the Clean Energy Act (CEA) (P.L. 2018, c.17, 2018) was passed in 2018. In recent years, New Jersey adopted additional legislation invigorating the State's efforts to reduce emissions in the building sector and drive the adoption of clean technology.

Building Codes

New Jersey's Uniform Construction Code (UCC) is updated approximately every three years, adopting the most current International Building Codes in effect at that time. The most recent updates and adoptions included the 2021 IECC (N.J.S.A. 5:23-3.18, 2022) and ASHRAE Standard 90.1-2019 (N.J.S.A. 5:23-3.16, 2022), which incorporate greater energy efficiency and conservation requirements for both new residential and commercial buildings, respectively.

Building Sector Goals

Through legislation, memorandums of understanding (MOU), and commitments, New Jersey has set goals to advance buildings' energy efficiency and accelerate the heat pump market throughout the State:

- **Executive Order 316 (EO 316):** The State aims to electrify 400,000 homes and 20,000 commercial properties by 2030, with 10% of all low-and-moderate income properties electrification ready by 2030. Further, the Governor's Office published the Strategic Building Decarbonization Roadmap in 2025, which highlights key

⁹ Refer to the 80x50 GWRA report for a summary of relevant policies prior to 2020.

developments in electrifying and reducing emissions in the State's building stock (Exec. Order No. 316, 2023; Synapse Energy Economics, 2025).

- [Executive Order 317 \(EO 137\)](#): The State aims to reduce emissions through its natural gas utilities, where the NJBPU will evaluate and plan for natural gas' future in the State and a potential Clean Heat Standard policy (Exec. Order No. 317, 2023).
- [United States Climate Alliance Commitment](#): Signatory states aim to install 20 million heat pumps across participating states by 2030, where 40% of the benefits go to low-income households (USCA, 2023). Further, New Jersey committed to considering the potential for a Clean Heat Standard.
- [Northeast States for Coordinated Air Use Management \(NESCAUM\) MOU](#): Signatory states aim to cumulatively transition 65% of residential heating and cooling equipment to zero emission heat pumps by 2030 and 90% by 2040, with 40% of the investments for incentives or technical guidance directed to low-income households (NESCAUM, 2024a).

[Energy and Water Benchmarking Program](#)

Directed by the CEA (P.L. 2018, c.17, 2018), the NJBPU established the Energy and Water Benchmarking Program in 2022. Effective December 2023, the program requires commercial and public buildings over 25,000 square feet to benchmark their energy and water usage with continued tracking of performance over time (NJBPU, 2022). Buildings under this 25,000 square feet requirement have the option to voluntarily benchmark their building's energy and water usage.

[Energy Efficiency Programs](#)

Many of the policies implemented in the State are supported by a series of programs incentivizing energy efficiency and building decarbonization efforts (Table 2.3). Most of these programs are administered by the NJBPU, NJCEP, NJEDA, and energy utilities. Effective July 2021, many rebate offerings for energy efficient appliances, lighting, home heating and cooling equipment and office equipment, which were previously offered through the NJCEP, transitioned to electric and gas utilities.

Table 2.3. Key New Jersey Building Decarbonization Programs.

Name	Focus	Building Sector
NJBPU and NJCEP Programs		
Combined Heat & Power & Fuel Cells	Renewable energy	Commercial & Industrial, Local Governments
Comfort Partners	Energy efficiency, health & safety	Residential (Income-qualified)
Community Energy Plan Grants	Building electrification, energy efficiency, energy storage, renewable energy	Local Governments
Energy Savings Improvement Program (ESIP)	Energy auditing, renewable energy, energy efficiency, building electrification	Local Governments
Garden State Energy Storage Program	Energy Storage, renewable energy	Government and Private entities
Higher Education Building Decarbonization Pilot Program	Building electrification, energy efficiency, EV chargers, energy storage, renewable energy	Commercial (Higher education campuses and universities)
Large Energy Users	Energy auditing, energy efficiency	Commercial & Industrial, Local Governments
Local Government Energy Audit	Energy auditing, energy efficiency	Local government, colleges, universities, and non-profit agencies
New Construction Program	Energy efficiency	Residential, Commercial & Industrial (new construction), Multifamily, Local Governments

NJEDA Programs		
Garden State Commercial Property Assessed Clean Energy (C-PACE)	Energy auditing, building electrification, energy efficiency, energy storage, renewable energy, health & safety	Commercial
NJ Clean Energy Loans	Building electrification, energy efficiency, energy storage, renewable energy	Residential, Commercial
NJ Cool Pilot	Building electrification, energy efficiency, energy storage, renewable energy	Commercial
NJ Green Bank	Building electrification, energy efficiency, energy storage, renewable energy	Commercial
RETROFIT NJ – Coming Soon	Energy auditing, building electrification, energy efficiency, energy storage, renewable energy, EV chargers	Commercial & Industrial, Institutions, multifamily
Small Business Improvement Grant	Building electrification, energy efficiency	Commercial (small businesses), Non-profit agencies
Utility Programs		
Appliance Rebates	Energy efficiency	Residential (homeowners)
Building Decarbonization	Building electrification, energy efficiency	Residential, Commercial & Industrial
Demand Response	Demand response, energy efficiency	Residential, Commercial & Industrial
Energy Efficient Products	Energy efficiency	Residential (homeowners)
Equipment Upgrade: Direct Install	Building electrification, energy efficiency	Commercial & Industrial, Government entities, non-profit agencies
Equipment Upgrade: Custom	Energy auditing, building electrification, energy efficiency	Commercial & Industrial, Government entities, non-profit agencies
Equipment Upgrade: HVAC and Water Heating	Building electrification, energy efficiency	Residential (homeowners)
Equipment Upgrade: Prescriptive	Building electrification, energy efficiency	Commercial & Industrial, Government entities, non-profit agencies
Income-Qualified Weatherization	Building electrification, energy auditing, energy efficiency, health & safety	Residential (Income-qualified)
Multi-Family	Energy auditing, energy efficiency	Residential (multifamily)
Whole Home Energy Assessment	Energy auditing	Residential (homeowners and renters)
Whole Home Energy Solutions	Energy auditing, energy efficiency	Residential

‘Lead by Example’ Programs

State agencies have taken the initiative to undergo Lead by Example (LBE) initiatives with the ultimate goal of showcasing that building electrification and energy efficiency is achievable, with government entities leading the way for the residential and commercial building sector. State agencies promote energy efficiency by working with the Division of Property Management and Construction (DPMC) to develop energy savings plans and implement the High Performance Green Building Standards for State Buildings Law (P.L. 2007 c.269, 2008), which requires all new state construction over 15,000 square feet to meet LEED silver level or above. NJDEP’s Administrative Order 2023-13 directed the Department to develop a LBE initiative, inventory its buildings via audits and benchmarking, implement plans to reduce energy usage and emissions, and introduce energy efficiency and renewable energy measures (Administrative Order 2023-13, 2023). DPMC has developed a Solar Power Purchase Agreement (PPA) for State agencies to leverage to offset their electricity demand via solar. Additionally, NJBPU directly supports LBE initiatives, via the Local Government Energy Audit (LGEA) program, which provides funding to local government agencies, State colleges and universities, select non-profit agencies, and others to examine and identify how they can reduce their energy use (NJCEP, 2025b).

Other Enabling Policies and Programs

The State has enacted several laws to further reduce greenhouse gas emissions in the residential and commercial buildings sector:

- **P.L. 2021, c.200:** The State introduced the School and Small Business Energy Efficiency Stimulus Program Fund which provided financial support to school districts and small businesses to evaluate their building's energy efficiency and make appropriate upgrades and installations (P.L. 2021 c.200, 2021).
- **P.L. 2021, c. 278:** Tax credits provided to builders using low carbon concrete in new constructions (P.L. 2021 c.278, 2021).
- **P.L. 2021, c. 290:** Requires warehouses larger than 100,000 square feet to be solar-ready (P.L. 2021 c.290, 2021).
- **P.L. 2021, c.464:** The Appliance Standards law furthered energy and emissions savings in buildings by setting minimum energy and water efficiency requirements for appliances and equipment sold in New Jersey. The standards use EnergyStar specifications as the minimum requirements for appliances and equipment, such as dishwashers, ovens, toilets, showerheads, and more (P.L. 2021 c.464, 2022).
- **Whole House Pilot Program:** A NJBPU program that targets low and moderate income (LMI) households located in Trenton, New Jersey, for home health and safety upgrades prior to energy efficiency upgrades via the Comfort Partners program (Green & Healthy Homes Initiative, 2022).
- **Weatherization Assistance Program:** A NJDCA program that furthers weatherization efforts by providing financial grants to low-income households for home building envelopes and heating equipment upgrades (NJDCA, 2025).
- **Low-Income Home Energy Assistance Program:** A NJDCA program that offers financial assistance to residents struggling with their heating and cooling bills via the Low-Income Home Energy Assistance Program (NJDCA, n.d.).





THE PATH FORWARD

The BAU scenario shows that in the absence of policies to reduce emissions from the residential and commercial sectors, their combined emissions are projected to increase to 27 MMT CO₂e by 2050. As previously discussed, implementation of the Current Policy Scenario will lower these emissions to 18.4 MMT CO₂e in 2050. To drastically drive down emissions from the residential and commercial sectors, the State will need to pursue additional actions, as outlined in the following Comprehensive Climate Action Plan (CCAP) Policy Scenario:

- 100% residential and commercial heat pumps sales by 2050;
- 100% heat pump hot water heater sales by 2050;
- Adoption of the latest building codes for new construction; and
- Envelope retrofits for 59% of residential buildings and 72% of commercial buildings.

Achieving the goals under the CCAP Policy Scenario can reduce this sector's emissions to 4.6 MMT CO₂e by 2050 (Figure 2.7). With much of New Jersey already developed, modeling assumes that the majority of fossil fueled equipment is replaced gradually and at the point of failure (i.e., a stock rollover model) by 2050 with significant numbers of replacement beginning in 2030, after several years of demonstration projects illustrating the technologies' effectiveness.

However, it is important to note that this approach is predicated on complementary efforts that decarbonize the electric generating sector. Under the CCAP Scenario, annual electric demand would more than double from 71 TWh in 2023 to 149 TWh in 2050 due to electrification of the economy. Thus, decarbonization of New Jersey's electric generation, the wide adoption of energy efficiency measures, and other energy demand reduction tactics will be necessary to alleviate the anticipated growth in electricity demand.

2050 SECTOR EMISSION GOAL

4.6 MMT CO₂e

EMISSION ACTIVITIES

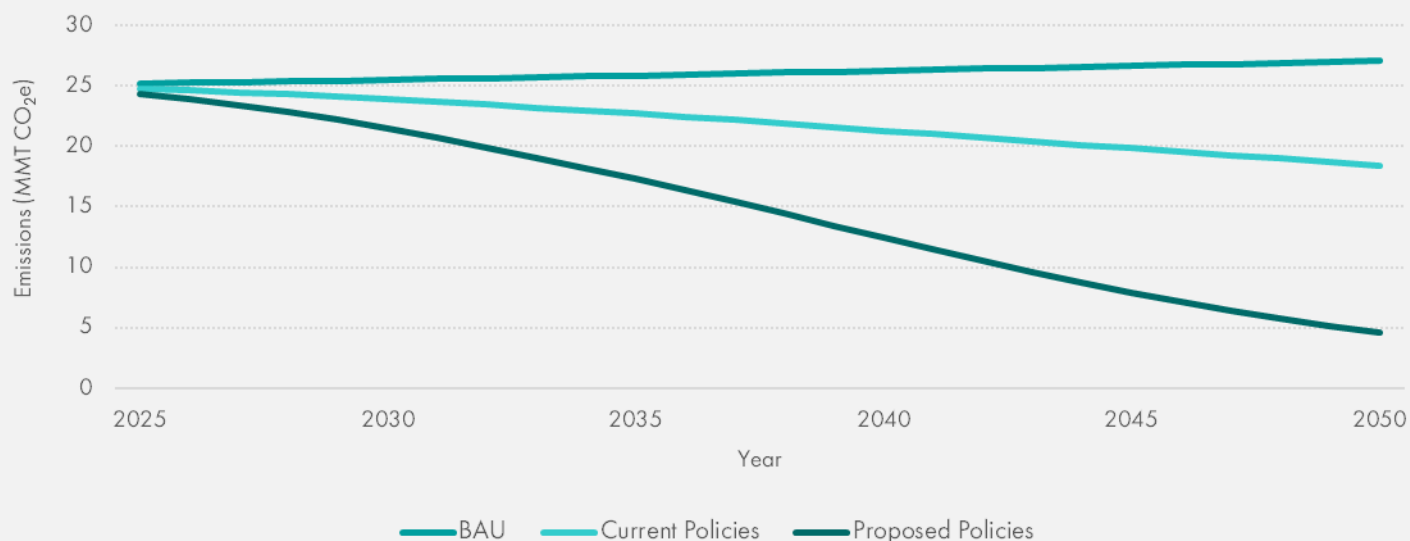
- Space Heating
- Water Heating
- Cooking
- Clothes Drying
- Running Generators

EMISSIONS REDUCTION MEASURES

1. Accelerate heat pump installations
2. Adopt a Clean Heat Standard
3. Upgrade building envelopes
4. Establish all-electric building codes
5. Adopt statewide Building Performance Standards
6. Adopt Zero Emissions Standards for space and water heating
7. Lead by example by decarbonizing State, county and municipal resources

Figure 2.7. Residential and Commercial Sector Emissions under the CCAP Scenario.

Residential and Commercial Sector emissions are predicted to decline through 2050 under the CCAP Scenario to 4.6 MMT CO₂e, a 22.4 MMT CO₂e decline compared to the Business-As-Usual Scenario and 13.8 MMT CO₂e decline compared to the Current Policy Scenario.



The State must continue to take decisive action to realize the CCAP Scenario and significantly ramp up efforts to mitigate emissions to achieve its goal of curbing sector emissions to 4.6 MMT CO₂e by 2050. The NJDEP identified seven measures that will likely be necessary to achieve the scale of emissions reductions envisioned for the building sector:

- **Measure 1:** Accelerate heat pump installations
- **Measure 2:** Adopt a Clean Heat Standard
- **Measure 3:** Upgrade building envelopes
- **Measure 4:** Establish all-electric building codes
- **Measure 5:** Adopt statewide Building Performance Standards
- **Measure 6:** Adopt Zero Emissions Standards for space and water heating
- **Measure 7:** Lead by example by decarbonizing State, county and municipal resources

These measures align with the State's Strategic Roadmap for Building Decarbonization report (Synapse Energy Economics, 2025), released in November of 2025. Collectively, implementing a combination of policies based on the above strategies can accelerate the reduction of residential and commercial building sector emissions towards the goal of 4.6 MMT CO₂e by 2050. Specifically, reducing residential sector emissions to 1.7 MMT CO₂e and commercial sector emissions to 2.9 MMT CO₂e by 2050.

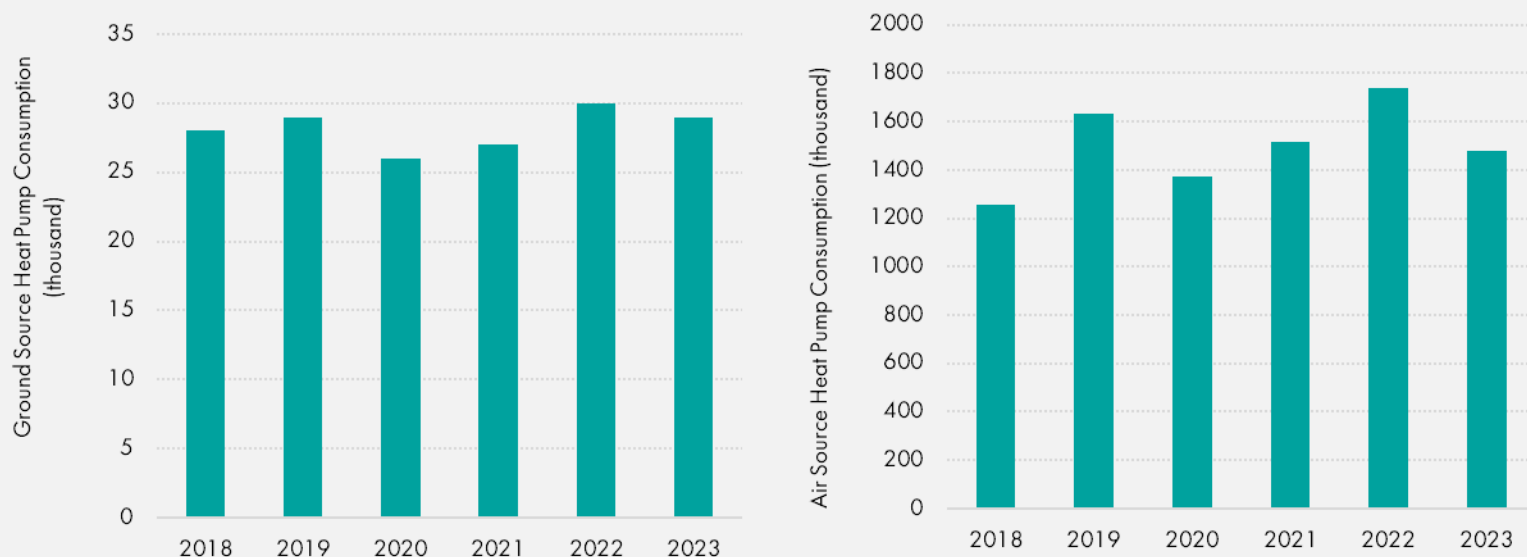
Emissions Reduction Measure 1: Accelerate heat pump installations

Replacing residential and commercial space heating and water heating equipment with heat pumps is an established strategy for reducing emissions. Over the past thirty years, heat pump-based systems have emerged as viable alternatives to fossil fuel-based systems for heating living spaces and hot water and are now reaching technological maturity with the arrival of cold-climate systems for space heating and consumer-accessible heat pump hot water heaters available at retailers across the country. Ground source heat pumps (GSHPs) and air source heat pumps (ASHPs) are two promising heating and cooling alternatives to fossil systems, proving efficiencies of 324% and 265%, respectively (rb&m, 2024). The market for these heat pumps is well established, growing between 2018 and 2023, with sustained demand even during the 2020-21 COVID-19 pandemic (Figure 2.8) (USEPA, 2018-2023). The current level of sales shares of

heat pumps in New Jersey is 4% in both the residential and commercial sectors¹⁰ (NREL, 2024; USEIA, 2023b). From this, it is clear that State policies can accelerate sales and help consumers learn about heat pump technology.

Figure 2.8. United States Energy Star Ground Source and Air Source Heat Pump Market (USEPA, 2018-2023).

Shipments of ground source and air source heat pumps across the United States have been growing between 2018 and 2023.



Under the Current Policy Scenario, it is projected that residential heat pumps will account for only 50% of space heating sales and 64% of hot water sales by 2050. New Jersey will need to significantly increase sales of heat pumps for space and water heating in the State to 100% by 2050 to reach its GHG reduction goal. Further, an early transition of sales to heat pumps is essential because residential heating systems have long lifetimes; decisions made today will set the course for emissions reductions decades into the future. Fortunately, this technology is already widely available, enabling rapid growth in sales in the near future. The CCAP Scenario identifies optimal sales and stock targets for residential space heating heat pumps as follows: 66% by 2030, with a stock of 0.6 million; 78% by 2035, with a stock of 1.3 million; and 100% by 2050, with a stock of 3.7 million (Figure 2.9 and Figure 2.10). Additionally, residential hot water heat pumps sales targets are set at 18% by 2030, with a stock of 0.3 million; 54% by 2035, with a stock of 0.9 million; 90% by 2040, with a stock of 2.0 million; and 100% by 2050, with a stock of 4.0 million (Figure 2.11 and Figure 2.12).

¹⁰ GSHPs comprise 0% and 1% sales share for residential and commercial space heating, respectively. Whereas, ASHPs have a 4% and 3% sales share for residential commercial space heating, respectively.

Figure 2.9. Annual Sales of Residential Space Heating Heat Pumps in the CCAP and Current Policy Scenarios.
Sales of heat pumps for residential space heating are estimated to increase to over 226 thousand by 2050 under the CCAP Scenario, about 112 thousand higher than the Current Policy Scenario.

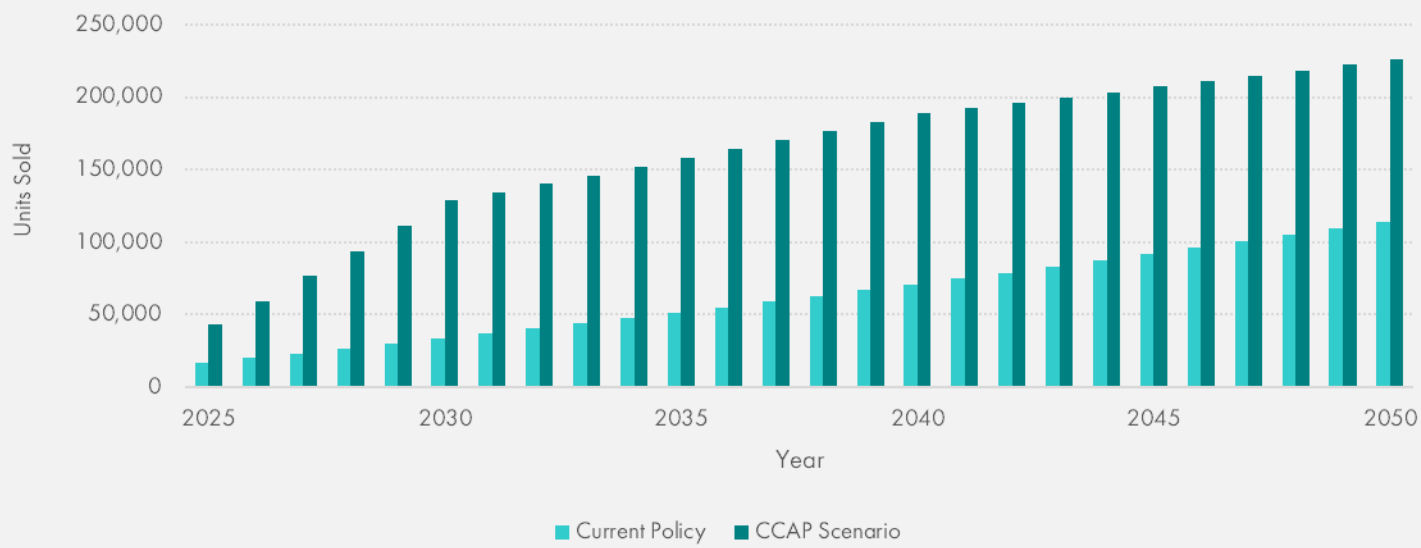


Figure 2.10. Installed Stock of Residential Space Heating Heat Pumps in the CCAP and Current Policy Scenarios.
Installed stocks of heat pumps for residential space heating are estimated to increase to over 3.7 million by 2050 under the CCAP Scenario, about 2.3 million higher than the Current Policy Scenario.

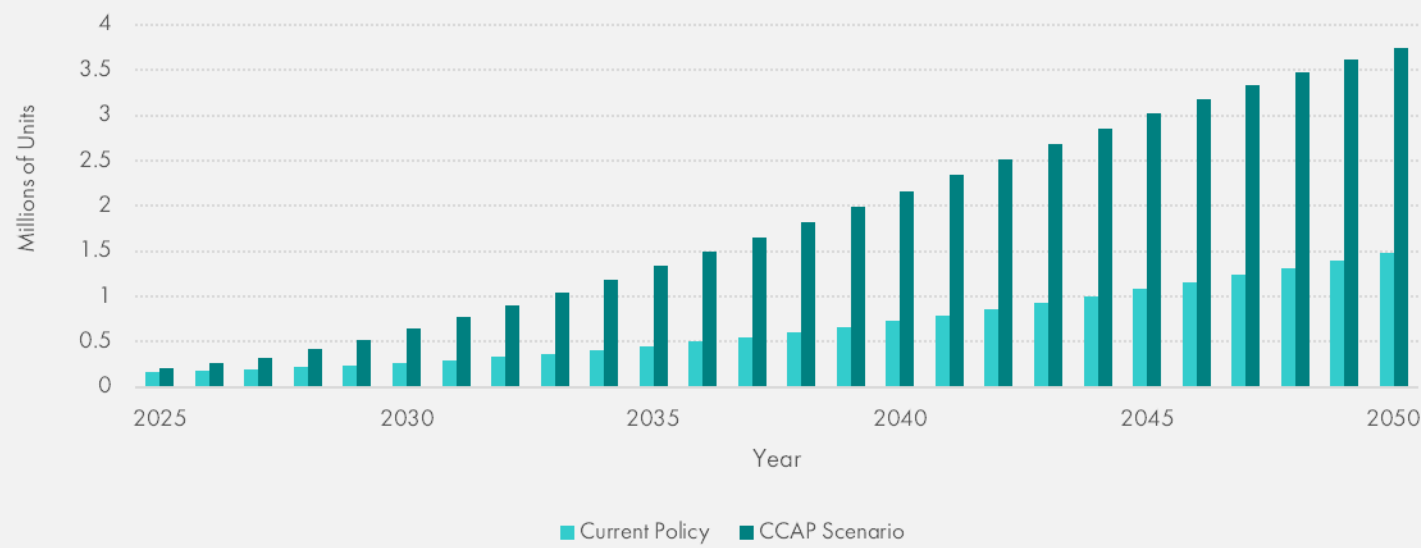


Figure 2.11 Annual Sales of Residential Hot Water Heat Pumps in the CCAP and Current Policy Scenarios.
Sales of heat pumps for residential water heating are estimated to increase to over 364 thousand by 2050 under the CCAP Scenario, about 130 thousand higher than the Current Policy Scenario.

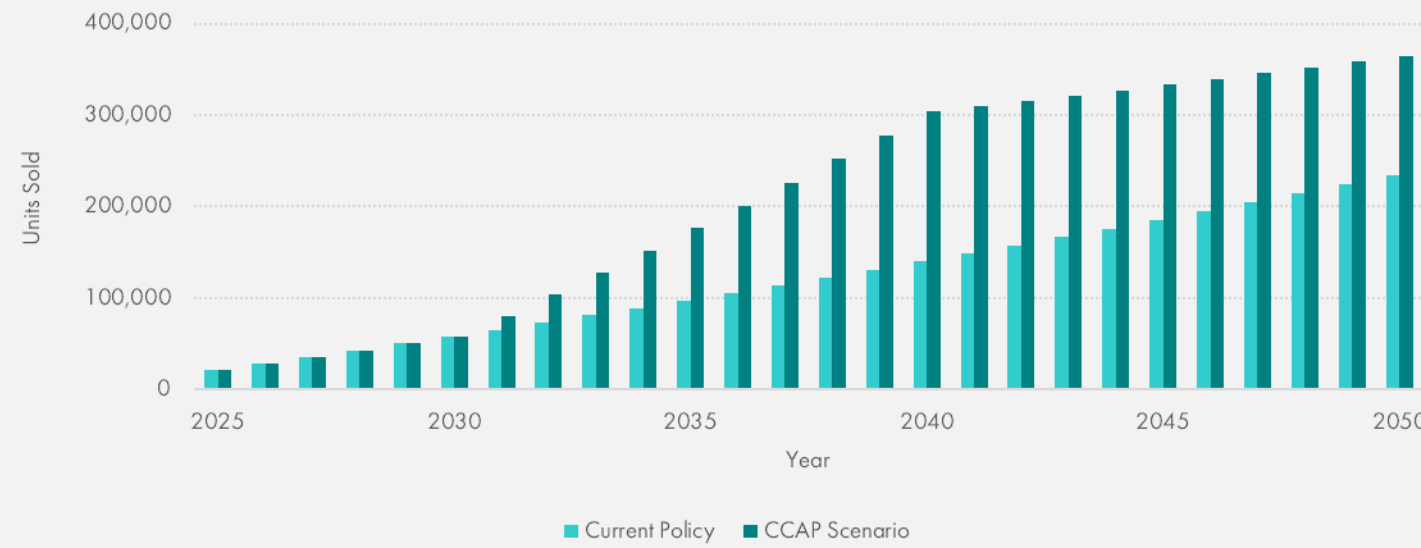
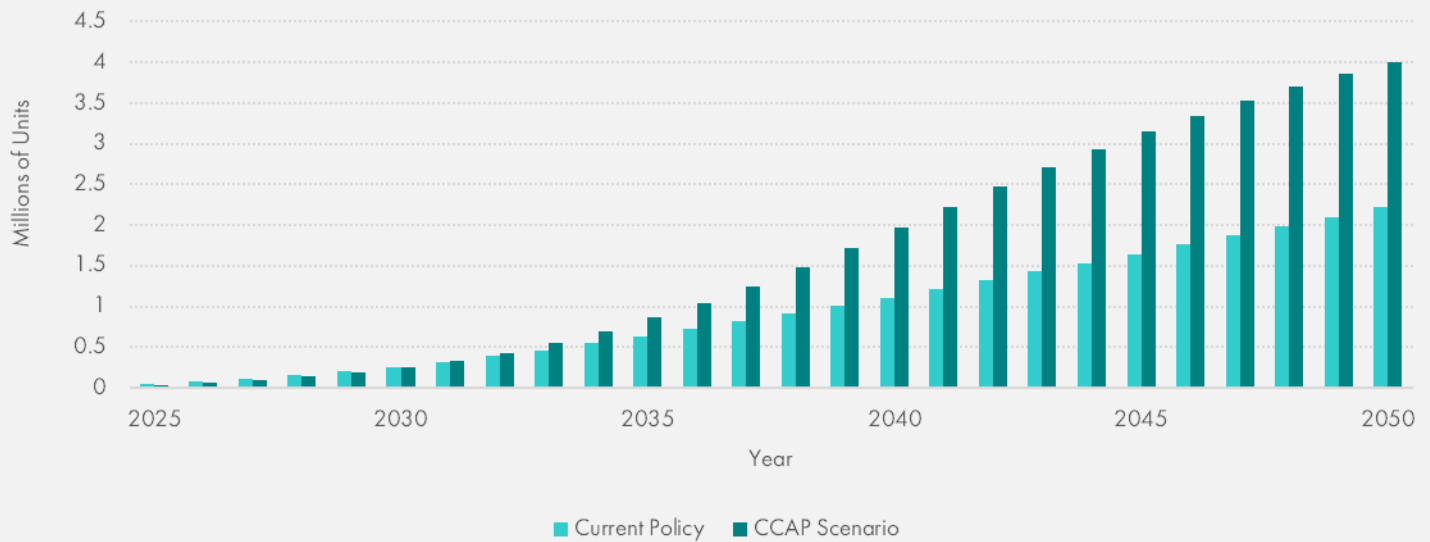


Figure 2.12 Installed Stock of Residential Hot Water Heat Pumps in the CCAP and Current Policy Scenarios.

Installed stock of heat pumps for residential water heating are estimated to increase to 4 million by 2050 under the CCAP Scenario, about 1.8 million higher than the Current Policy Scenario.



For the commercial sector, current policies are expected to result in 27% space heating heat pump sales share and 18% of hot water heat pumps sales in 2050. To achieve the 80x50 mandates, outlined in the CCAP Scenario, commercial sector space heating heat pump sales and stock rates must achieve 32% by 2030, with a stock of 16.0 billion BTU per hour (hr) of capacity; 66% by 2040, with a stock of 74.1 billion BTU/hr of capacity; and 100% by 2050, with a stock of 158.6 billion BTU/hr of capacity (Figure 2.13 and Figure 2.14). A key distinction between residential and commercial sector space heating is that residential dwellings have fairly consistent floor space and occupancy sizes, and sales can be meaningfully expressed in terms of the number of heating units sold or the number of homes converted. In contrast, commercial space spans an enormous range of sizes, from small kiosks to large office complexes. As a result, adoption rates are expressed in terms of heating capacity, for example in BTU/hr heating capacity installed per year. This in turn is related to the floor space of the commercial facility rather than the number of converted buildings. The percentages of sales and installed stock for commercial space are therefore discussed in terms of capacity rather than number of heating units or buildings. With respect to commercial hot water heating, sales share and installed stocks should increase on a capacity basis under Measure 1 to approximately 14% in 2030, with a stock of 0.8 billion BTU/hr of capacity; 51% in 2035, with a stock of 2.8 billion BTU/hr of capacity; and near 100% in 2050, with a stock of 15.9 billion BTU/hr of capacity (Figure 2.15 and Figure 2.16).

Figure 2.13. Annual Sales of Commercial Space Heating Heat Pumps in the CCAP Scenario and under Current Policies (Expressed as Billion BTU/hr Heating Capacity).

Sales of heat pumps for commercial space heating are estimated to increase to 10.4 billion BTU/hr capacity by 2050 under the CCAP Scenario, about 7.6 billion BTU/hr capacity higher than the Current Policy Scenario.

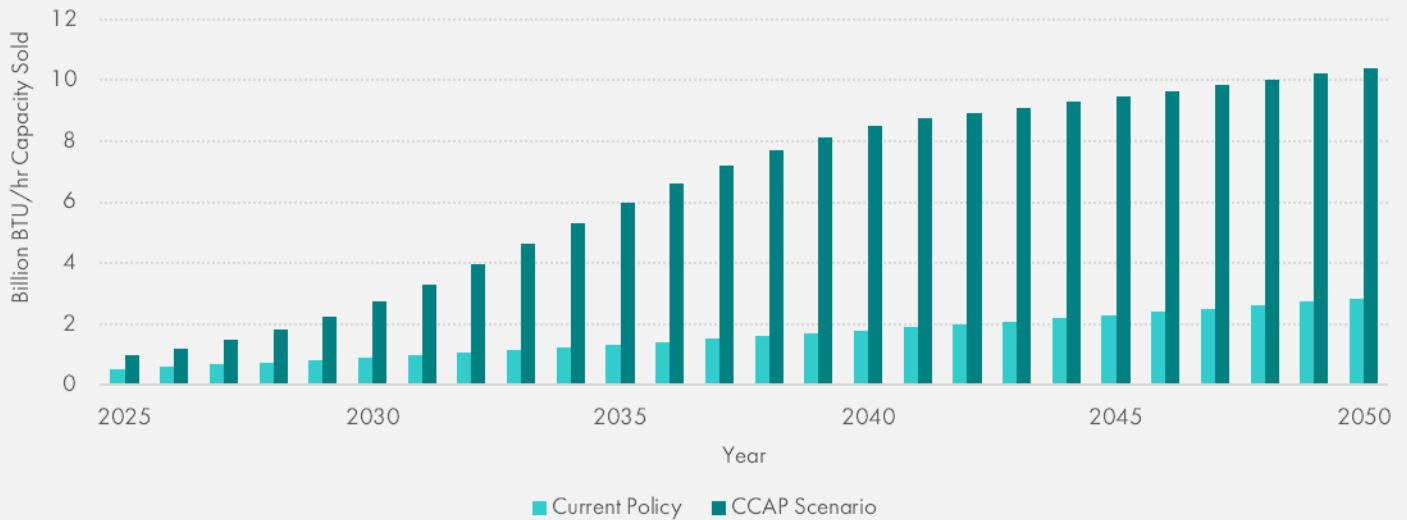


Figure 2.14. Installed Stock of Commercial Space Heating Heat Pumps in the CCAP Scenario and under Current Policies (Expressed as Billion BTU/hr Heating Capacity)

Installed stock of heat pumps for commercial space heating are estimated to increase to 158.6 billion BTU/hr capacity by 2050 under the CCAP Scenario, about 119.5 billion BTU/hr capacity higher than the Current Policy Scenario.

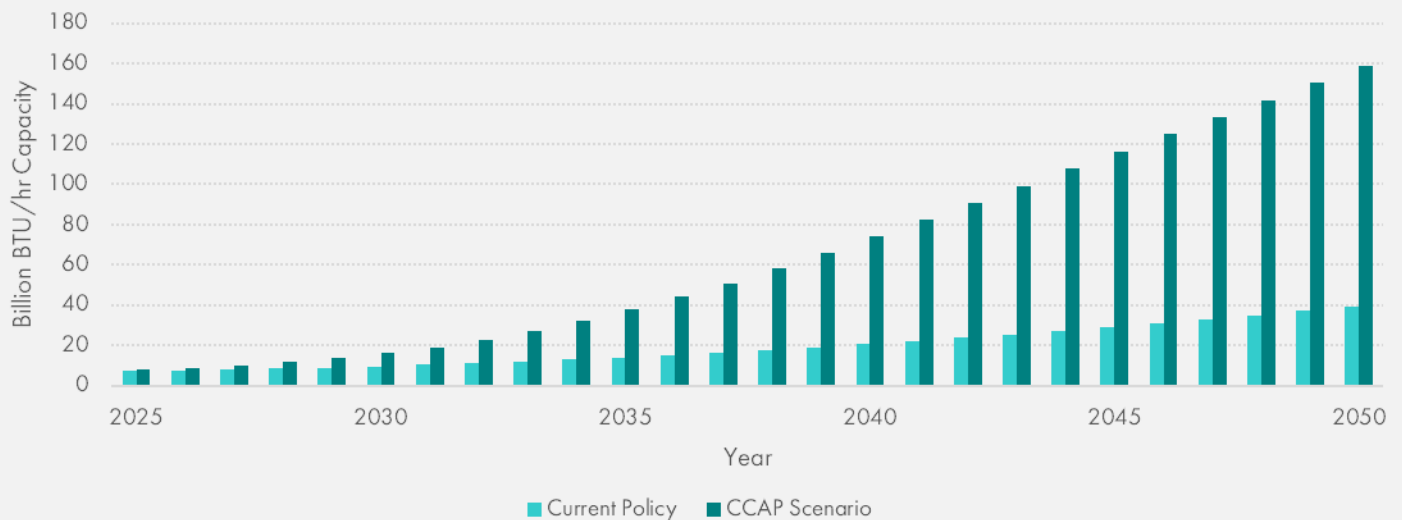


Figure 2.15. Annual Sales of Commercial Hot Water Heat Pumps in the CCAP Scenario and under Current Policies (Expressed as Billion BTU/hr Heating Capacity).

Sales of heat pumps for commercial water heating are estimated to increase to 1.5 billion BTU/hr capacity by 2050 under the CCAP Scenario, about 1.3 billion BTU/hr capacity higher than the Current Policy Scenario.

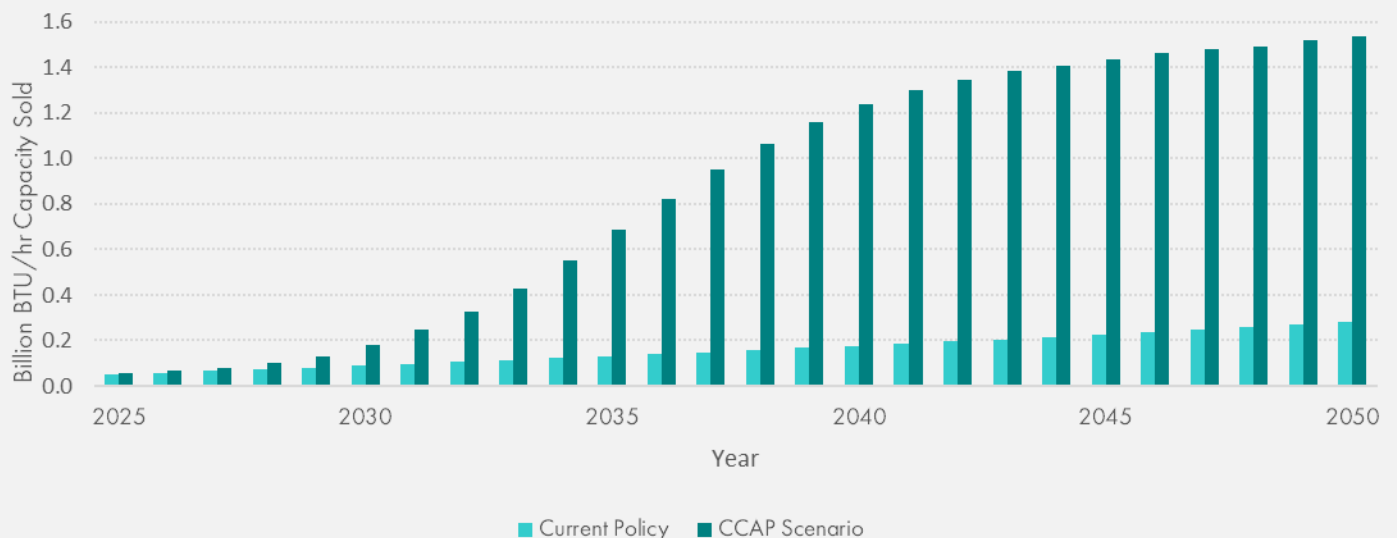
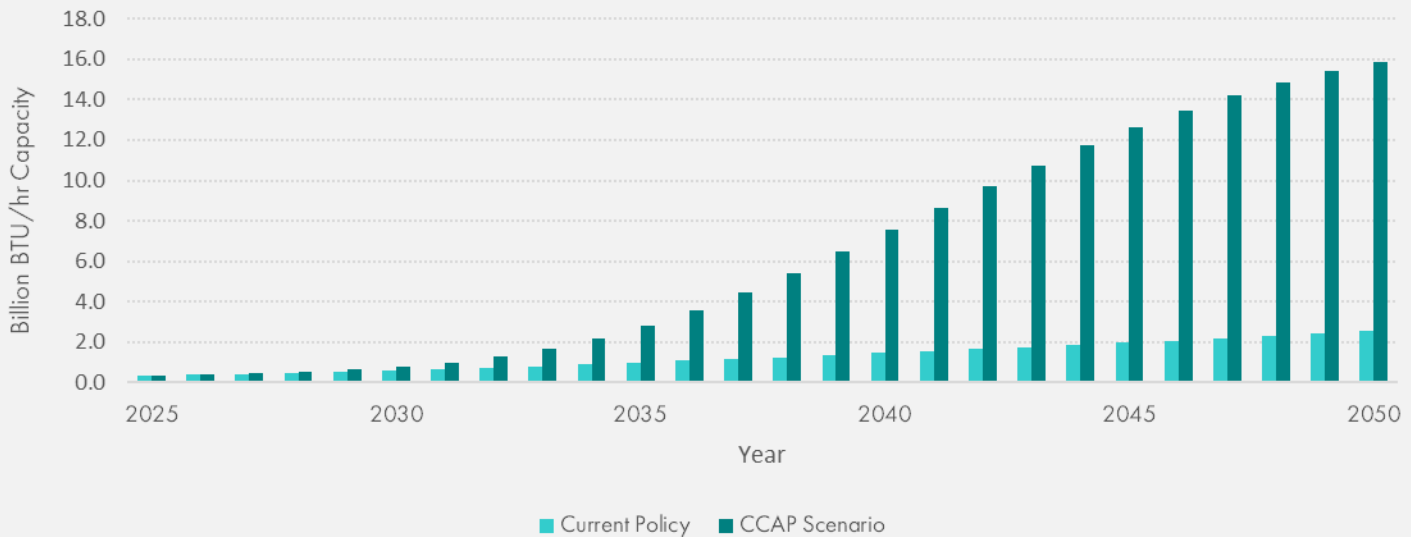


Figure 2.16. Installed Stock of Commercial Hot Water Heat Pumps in the CCAP Scenario and under Current Policies (Expressed as Billion BTU/hr Heating Capacity).

Installed stock of heat pumps for commercial water heating are estimated to increase to 15.9 billion BTU/hr capacity by 2050 under the CCAP Scenario, about 13.3 billion BTU/hr capacity higher than the Current Policy Scenario.



Where heat pump adoption can be thought of as a *strategy* for reducing emissions, specific *tactical* actions must be taken to achieve the goals of Measure 1. Further, these tactical actions must prioritize the social needs of the State’s residents and address their individual circumstances. For example, immediate opportunity for electrification exists in areas without natural gas distribution and with significant numbers of legacy fuel oil and propane heating systems. Oil and propane are carbon intensive fuels, hence prioritizing the transition away from these fuels will result in significant early reductions in residential and commercial building emissions. Although in 2023 only 7% of New Jersey’s households used fuel oil as their primary heating fuel, and 2.5% used propane (United States Census Bureau, 2024), there are communities throughout the State where natural gas distribution networks are limited and present great opportunities for targeted electrification.

In 2020, the largest percentage of total homes within each municipality using fuel oil for heating were located in Cape May, Hunterdon, Salem, and Sussex counties (Figure 2.17) (United States Census Bureau, 2024). Similarly, the greatest percentage of total homes within each municipality using propane were located in Cumberland, Hunterdon, Morris, Salem, Sussex, and Warren counties (Figure 2.18). The northwest parts of the State and rural southern areas do not have access to natural gas infrastructure making them obvious earlier adopters for electrification. Moreover, Newark and Jersey City have some of the highest number of homes using fuel oil and propane. Considering oil and propane are carbon intensive fuels, focusing initial conversions to these segments of the building sector will result in significant early reductions in residential and commercial building emissions and could also provide local air quality co-benefits, through the reduction of particulate matter, exposure to which is linked to asthma, obesity, developmental delays, and other health problems.

Additional economic benefits can occur from electrification, especially considering ASHPs are highly efficient compared to propane and heating oil. New Jersey’s customers switching to ASHPs from fuel oil and propane can save up to \$1,131 and \$985 on energy bills each year, respectively (Energy Solutions, 2024). Electric customers installing ASHPs can experience even higher savings, totaling \$1,550 each year (Energy Solutions, 2024). These heat pumps can also provide efficient space cooling which avoids purchasing separate air conditioners and furnaces, and results in additional energy and cost savings.

Figure 2.17. Fuel Oil Heating Equipment by Total and Percentage in the Residential Sector.

The largest percentage of homes using fuel oil for heating were located in Cape May, Hunterdon, Salem, and Sussex counties.

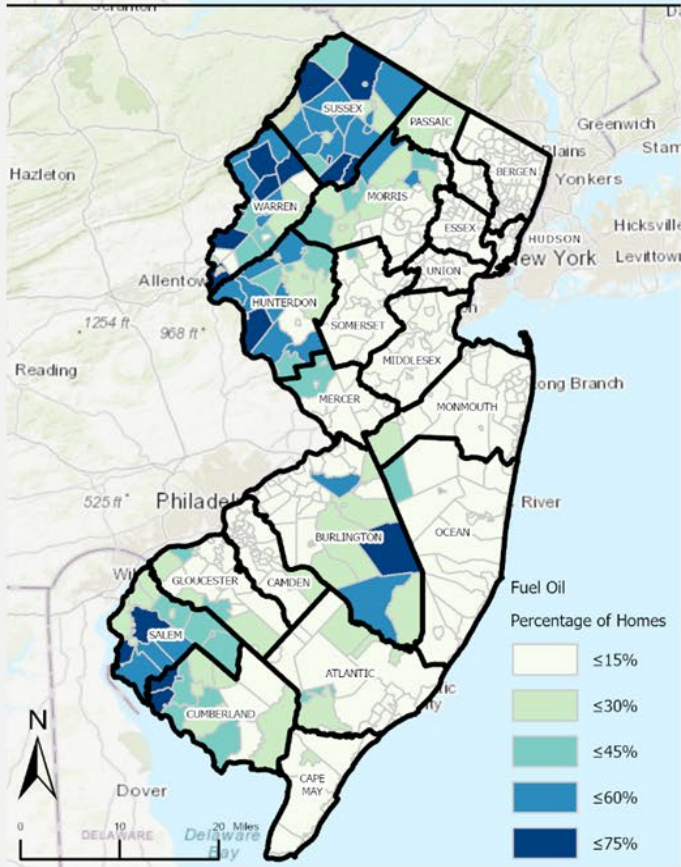
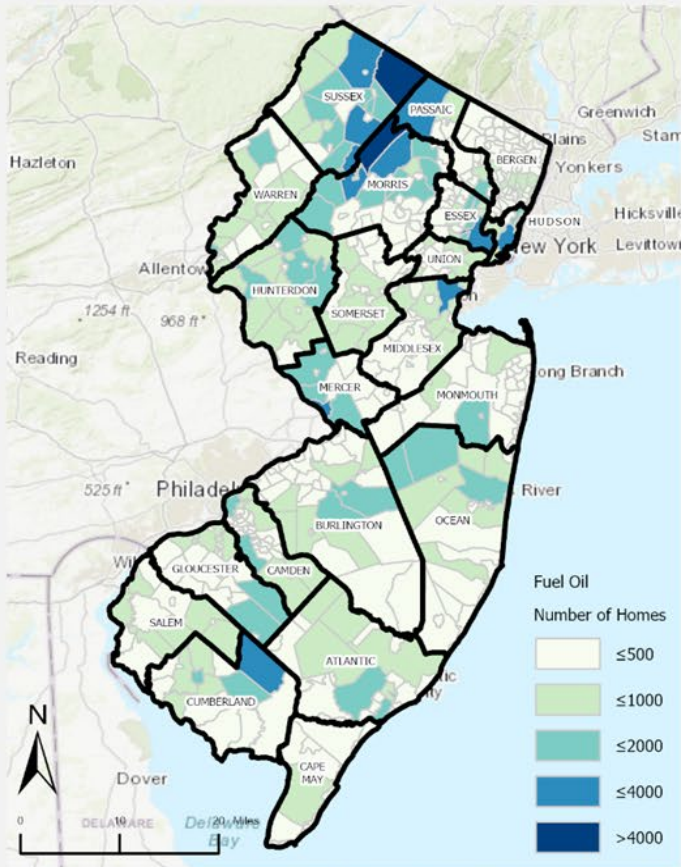
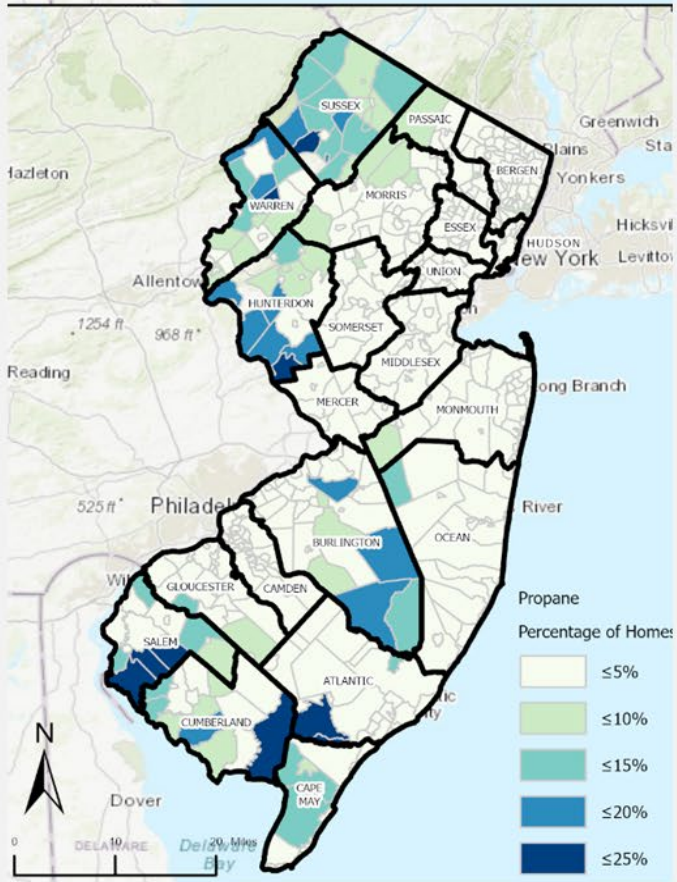
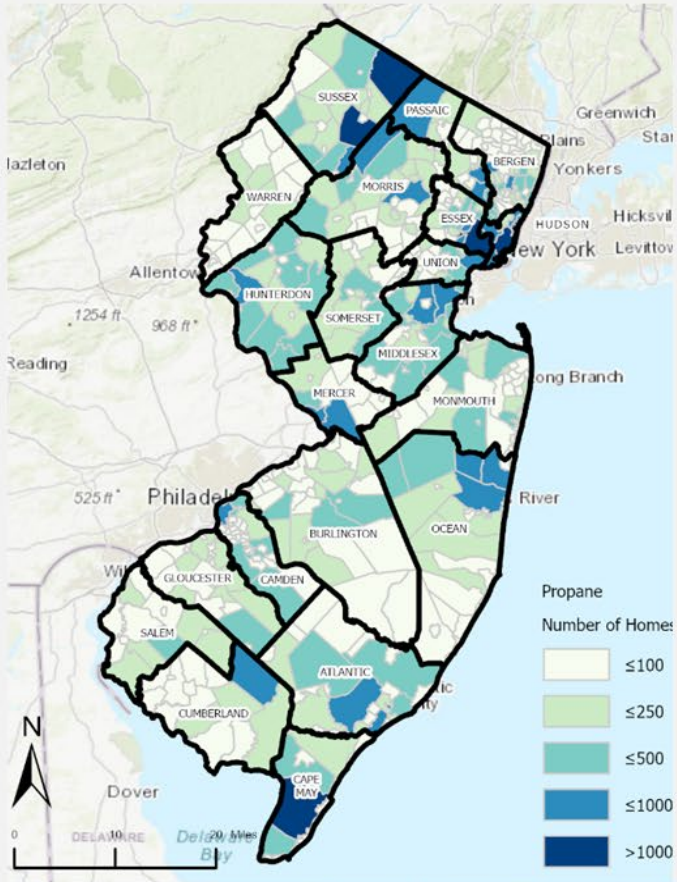


Figure 2.18. Propane Heating Equipment by Total and Percentage in the Residential Sector.

The greatest percentage of homes using propane were located in Cumberland, Hunterdon, Morris, Salem, Sussex, and Warren counties.



Tackling natural gas use in the building sector will be a more complex and impactful process than addressing propane and fuel oil. Seventy-three percent of New Jersey residences are heated with natural gas, representing the bulk of the emissions in this sector. These buildings, coupled with commercial properties, will need to begin conversion to electricity now in order to achieve the State's emission reduction goals.

Measure Quantification

Combined emissions reductions from Measure 1, including heat pump adoption for both hot water and space heating, in both the residential and commercial sectors, is projected to reduce emissions by 2.1 MMT CO₂e in 2030; 4.6 MMT CO₂e in 2035, and 10.9 MMT CO₂e in 2050 (Figure 2.19). Cumulative emission reductions total 6.9 MMT CO₂e in 2030; 24.8 MMT CO₂e in 2035; and 152.9 MMT CO₂e in 2050 (Figure 2.20).

Figure 2.19. Combined Emissions Reductions from Measure 1, Accelerate Adoption of Heat Pump Technologies in the Commercial and Residential Sectors.
Estimated annual emissions mitigation is shown through 2050 based on residential and commercial space and water heating technologies adopted under Measure 1.

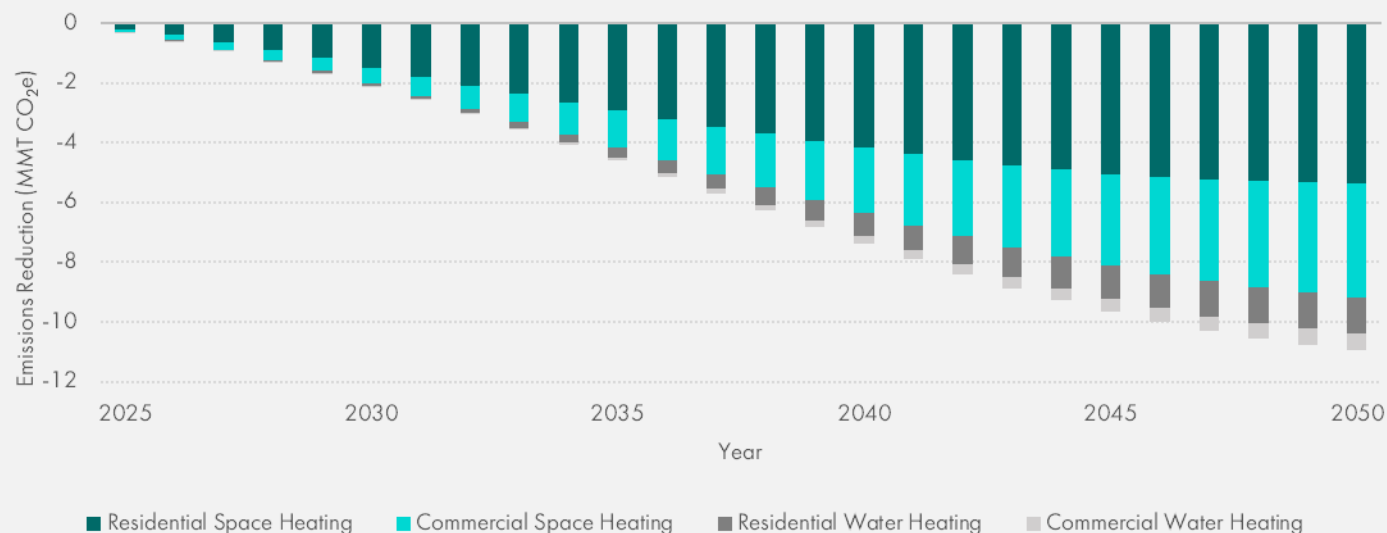
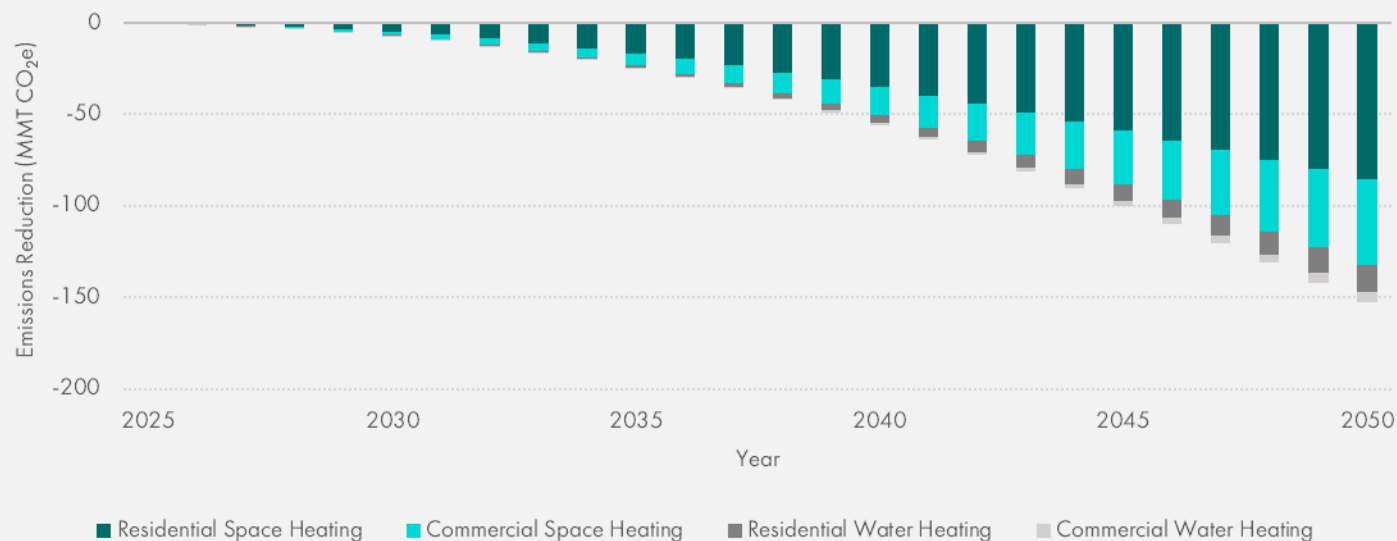


Figure 2.20. Cumulative Emissions Avoided by Measure 1, Accelerate Adoption of Heat Pump Technologies.

Estimated cumulative emissions reduction is shown through 2050 based on residential and commercial space and water heating technologies adopted under Measure 1.



Priority Enabling Actions

To successfully accelerate heat pump adoption, New Jersey will need to implement a suite of incentives, technology support offerings, education initiatives and workforce development programs in this space. NJDEP has identified 17 critical enabling actions to initiate this work.

Enabling Action 1.1 *Implement and expand upon the NJBPU's Triennial programs*

Pursuant to the CEA (P.L. 2018, c.17, 2018), the NJBPU establishes and refines energy efficiency, building decarbonization, and demand response programs every three years to require utilities to implement programs designed to result in electric and natural gas use reductions within their service territories. Commencing in 2021 and running through 2024, New Jersey utilities offered the first set of programs aimed at energy efficiency in buildings, referred to as Triennium 1. More recently, Triennium 2 programs went into effect in January 2025, with an updated framework for utilities to include building decarbonization start-up and demand response programs in addition to their energy efficiency program offerings (NJBPU, 2024). The NJBPU is currently working on an updated framework (Triennium 3) for utilities to reach the CEA-mandated electric and gas savings goals, with the framework anticipated in early 2026 and plans to be implemented beginning July 2027.

The NJBPU should continue to update its framework to align with the State's progress in attaining its clean energy and energy efficiency goals, and implement associated programs to accelerate clean, energy efficient technologies throughout the State.

Enabling Action 1.2 *Develop an energy advisor, navigator, or guide for energy customers seeking electrification and energy efficiency improvements*

The NJDEP recently released its Funding One Stop Shop (OSS), detailing statewide funding opportunities for the building sector, along with clean transportation, renewable energy and carbon sequestration (NJDEP; Atlas Public Policy, 2025). This interactive OSS online platform improves the New Jersey customer experience for accessing federal, state and utility energy efficiency funding. The NJDEP Funding OSS tailors the output of incentives to meet the customer's needs, including but not limited to financial considerations, homeownership status, and geographic location. As a result, the online platform makes finding funds for building-related upgrades seamless and efficient for customers.

As a supplement to this, the NJBPU should utilize this effort and develop a process to provide support to energy customers seeking funding for energy efficiency and renewable energy projects. An energy advisor, guide, or navigator platform can enhance the seamlessness for customers seeking funding, by meeting the customer where they are and coordinating effective outreach and delivery to maximize participation in building incentive programs. The NJBPU's navigator could utilize the NJDEP's Funding OSS and other tools and resources to provide direct support to energy customers by facilitating access to energy efficiency, building decarbonization, and demand response programs that offer financial incentives and subsidized loans in response to customers' goals, serving as a central source of information and coordination assistance throughout customers' participation in these programs, and referring customers to other clean energy programs as needed. A particular focus for the energy navigators to support access to and participation in programs by low- and moderate-income residents who often occupy the most poorly weatherized, energy-efficient housing stock, in overburdened communities and/or municipalities – and thereby prioritize serving some of the most energy-inefficient properties first – would enhance equity and affordability. Targeting these customers provides the greatest equity and emissions-reduction impact per dollar, while furthering GHG emission reductions and alleviating grid constraints statewide. As a prime example of this focus, energy navigators can facilitate participation by low-income residents in the statewide Comfort Partners program, which is offered jointly by the NJBPU and the utilities to provide no-cost energy improvements, increase comfort, and lower long-term utility bills and energy burdens for residents who often live in the most inefficient housing stock, are most affected by high utility costs, and are least able to invest in upgrades independently. Also, as part of the distribution of the Inflation Reduction Act's (IRA) Home Energy Rebates, NJBPU plans to expand Comfort Partners to provide heat pumps for delivered fuel customers seeking to convert to electric heating, as well as electrical panel upgrades and induction stoves. This emphasis on decarbonization is critical

for LMI customers to mitigate the risk of being stranded on the existing gas infrastructure by helping them transition to cleaner, long-term affordable electric heating.

Enabling Action 1.3 *Develop education and outreach materials and training and apprenticeship programs on heat pumps for residential and commercial stakeholders*

With the growing deployment of zero emission space heating and cooling systems, there is an increasing need for qualified, trained contractors to be aware of and install more efficient technologies. For context, the State expects the 2035 demand for relevant occupations to far exceed the 2022 workforce supply, particularly by 26.2% for electricians, 25.4% for HVAC mechanics and installers, 9.2% for construction managers, and 8.8% for construction laborers, among others (NJ Governor's Office of Climate Action and the Green Economy, 2025). Coincidentally, the need for experienced and well-trained workers poses a challenge when filling this labor gap, where 80% of HVAC technician firms, 63% of construction managers, and 60% of electricians indicated it is of 'great difficulty' to hire employees (NJ Governor's Office of Climate Action and the Green Economy, 2025).

The NJBPU is taking a strategic approach to address workforce training gaps by leveraging and coordinating with other State resources. In 2024, the NJBPU funded and published a report (the Heldrich Report) that identified several of these gaps. Based on the findings within the Heldrich report, a new initiative called the Business and Industry Leadership Team (BILT) was launched. BILT is a stakeholder engagement effort that builds on the Department of Labor and Workforce Development's "Industry Partnerships" initiative model. It uses a sector strategies approach to better understand the needs of employers, placing jobs and employment at the center of the initiative's focus. The goal is to connect energy efficiency and clean energy buildings' employers with training providers and community partners to ensure that workers receive both essential and technical training for successful careers in energy efficiency and clean energy buildings. This strategy is being explored during Triennium 2 in collaboration with utilities and is proposed to be monitored, refined, and potentially scaled in Triennium 3. The proposed approach aims to leverage existing utility workforce development funding, processes, and infrastructure from the Triennium program, alongside the Department of Labor's resources—including work-based learning grants—to identify braided funding opportunities that support residential and commercial clean buildings contractors.

As one example of State action to help ameliorate this challenge, the NJBPU recently deployed its New Construction Program, with one component of the program offering reimbursements for contractors pursuing training and certification. The NJEDA and NJDOL can further prepare the workforce for the building decarbonization path ahead by adding to the State's training and apprenticeship program offerings.

Additionally, as directly recommended by the Strategic Roadmap for Building Decarbonization report (Synapse Energy Economics, 2025), State agencies should coordinate to establish a clear, unified vision and plan for a Clean Buildings Hub dedicated to developing workforce training, awareness, and education for builders, architects, contractors, engineers, real estate agents, and code enforcers in the most efficient electrification, construction, and retrofit building techniques. Moreover, driving market demand for heat pumps (ASHPs and GSHPs) will require educational materials on their efficiency benefits, training curriculum to develop the workforce (including training for new workers, re-skilling of current workers in other fields, and upskilling of current contractors), and outreach resources to broaden awareness of the systems. State agencies should collaborate with partners to create or support the creation of materials for heat pump deployment targeted at key stakeholders, like building owners, state and local government officials, utility companies, and HVAC professionals.

Enabling Action 1.4 *Work with utilities to launch building decarbonization start up programs and additional demonstration "pilot" projects surrounding thermal energy networks*

As a condition under the CEA (P.L. 2018, c.17, 2018), the NJBPU Triennium 2 framework required the State's energy utilities to submit building decarbonization and demand response plans, in addition to their energy efficiency program offerings, by December 2023. The electric utilities proposed building decarbonization and demand response programs, and NJNG proposed a building decarbonization program focused on partial-load heat pumps (NJBPU, 2024). The NJBPU Board approved these plans in October 2024 that went into effect January 1, 2025. The State should build

upon the utilities' building decarbonization start-up programs following Triennium 2 and potentially reach a broader customer base.

Two of New Jersey's gas utilities, NJNG and PSE&G, are actively pursuing multi-year feasibility studies to evaluate the role of thermal energy networks (TENs) in maintaining reliable and affordable heating and cooling for customers. These studies include identification of candidate pilot projects and will surface lessons regarding technology design, workforce needs, infrastructure conversions, and community engagement. As gas demand changes over time, utilities are exploring TENs as a potential pathway to continue delivering thermal service without combustion-based fuels. The results of these utility-led studies will help inform future regulatory planning, support equitable energy transition strategies and market readiness, and ensure that customers benefit from reliable, low-carbon thermal solutions.

Enabling Action 1.5 *Develop a renewable heating and cooling web calculator tool for New Jersey*

The Clean Energy States Alliance (CESA) developed a Clean Heating and Cooling Calculator that provides details about potential cost savings and greenhouse gas emissions reductions associated with switching a customer's fossil-fueled heating and cooling technology to cleaner sources, such as an air source heat pump or a hybrid water heater or solar hot water (CESA, n.d.). The current calculator developed by CESA is specific to Connecticut and New York and does not apply to New Jersey. The NJBPU, in partnership with NJDEP, is seeking to expand the tool to cover the State of New Jersey and include the beneficial use and implementation efforts of TENs. The calculator would then be available on the NJCEP website.

Enabling Action 1.6 *Develop a ground source heat pump tool for New Jersey stakeholders and update the ground source heat pump baseline report*

NJDEP, in partnership with NJBPU, will develop a ground source heat (GSHP) pump feasibility tool for New Jersey stakeholders (NJBPU, 2023a). This platform will help visualize site-level suitability by incorporating geological characteristics, underground temperature profiles, land-use constraints, and existing clean-energy infrastructure. When completed, the tool will serve as a first-stop resource for building owners, contractors, local governments, utilities, developers, and customers alike to better understand the geothermal potential at the parcel and campus scale.

This capability will complement existing energy planning tools and support broader market education by helping stakeholders identify high-opportunity sites, including facilities with concentrated heating and cooling loads, properties in overburdened communities and municipalities, and buildings with inefficient legacy heating systems. As geothermal adoption grows, and as utilities evaluate the long-term feasibility of TENs, this resource will help ensure that project development is aligned with State energy, equity, and infrastructure goals. Regular updates to both the GIS tool and the GSHP baseline report will help track market evolution, incorporate new data layers (such as workforce availability or interconnection considerations), and ensure continued alignment with New Jersey's clean-energy strategy.

Enabling Action 1.7 *Establish phased pathways for large-scale thermal energy networks, beginning with utility-led pilots and supporting future community-scale deployment*

NJDEP, in partnership with NJBPU, will continue advancing an orderly, phased approach to deploying large-scale TENs in New Jersey. Near-term efforts will center on utility-led pilots, consistent with ongoing feasibility studies and current statutory direction, to evaluate the technical, economic, workforce, and community-benefit considerations associated with district-scale TENs systems. Notably, NJBPU is actively evaluating the feasibility of large-scale TENs pursuant to the Large-Scale Geothermal Heat Pumps Feasibility Study Law (P.L. 2023 c.328, 2024), with findings due by early 2026. These results will guide future siting strategies, program design, and regulatory pathways.

In parallel, New Jersey may explore longer-term market pathways that enable non-utility entities to pursue community-scale TENs systems where technically feasible and complementary to utility planning. This future-facing model could allow qualified projects to be developed at the campus or district scale, achieve early grid-capacity and emissions benefits, and later interconnect with, or be acquired by, the serving utility at a fair-market valuation after an agreed-upon operational period. Such a "plug-and-play" pathway would promote innovation and accelerate market participation, while ensuring that systems ultimately integrate into a cohesive statewide thermal network strategy.

To prepare for this potential pathway forward, New Jersey would evaluate foundational steps such as TENS-ready design guidance aligned with utility planning, early-phase feasibility coordination, and screening criteria to ensure alignment with grid needs, environmental protections, and equity objectives. Importantly, throughout this phased transition, NJBPU will remain the central planning authority to preserve system integrity, protect ratepayers, avoid stranded assets, and ensure that any future competitive participation complements, rather than conflicts with, regulated utility obligations and long-term TENS development. As technology, policy, and market readiness advance, this sequencing will position New Jersey to support both utility-scale and community-scale TENS deployment in a manner that maximizes emissions reductions, strengthens system reliability, and expands equitable access to next-generation space and water heating and cooling infrastructure.

Enabling Action 1.8 *Explore continuation of NJBPU's Higher Education Decarbonization Pilot Program*

In 2023, the NJBPU commenced its Higher Education Decarbonization Pilot Program which evolves the State's Large Energy Users Program, targets existing colleges and universities with multi-building campuses, and assists them to reach their clean energy goals (NJBPU, 2023b). The first phase of the pilot program ran from December 2023 to June 2025 and offered incentives to campuses seeking to develop a decarbonization plan for investment in renewable energy, energy storage, energy efficiency, TENS, electric vehicles and associated charging stations, and combined heat and power, to name a few. The NJBPU is currently reviewing applications for decarbonization plans and anticipates selecting awardees in the coming months. The NJBPU will then determine the potential future buildout of the program.

Enabling Action 1.9 *Phase out programs that incentivize fossil fuel equipment replacements*

As the State moves toward more energy efficient and clean sources of heating and cooling equipment, the incentivization of fossil fuel equipment should be phased out. Currently dedicated funding for fossil fuel equipment replacements and zero interest financing should be redirected toward more efficient and cleaner HVAC technologies. In addition, new gas-hybrid space and water heating systems should be avoided, as they are inconsistent with the State's long-term decarbonization trajectory and risk locking in fossil fuel dependency for decades. These systems can remain in service for 30–50 years, potentially extending gas infrastructure reliance, increasing stranded-asset risk, slowing transition progress, and increasing long-term costs for customers.

Enabling Action 1.10 *Require tenant protections for building owner participation in incentive programs*

To safeguard affordability and ensure housing stability, robust protections are essential for tenants residing in rental properties that undergo energy efficiency and HVAC improvements. Tenant displacement and unjust rent increases represent a major hurdle for these projects and must be mitigated. As such, State agencies should mandate tenant protection measures as a precondition for building owner eligibility in all relevant incentive programs.

Enabling Action 1.11 *Consider rate reform to encourage electrification and demand flexibility while improving equity*

As more energy customers transition from gas to electricity, there is the possibility for peak electricity demand to shift from summer to winter, causing higher energy bills for the customer under current rate structures. As such, there is a need to modernize existing energy utility rates to accommodate this shift. In an effort to encourage electrification and demand flexibility while ensuring equity, the NJBPU is exploring time-varying electric rates, seasonal rate discounts, and heat pump rates, and should ultimately implement the most optimal rate design.

Enabling Action 1.12 *Establish long-term statewide heat pump targets*

In addition to New Jersey's goals of electrifying 400,000 homes and 20,000 commercial properties by 2030 (Exec. Order No. 316, 2023), the State should establish legislatively mandated long-term statewide heat pump targets that span past 2030. In doing so, market stakeholders will have clearer direction on heat pump developments within the State and can prepare the workforce to meet the anticipated heat pump demand.

Enabling Action 1.13 *Implement the Governor's Office Strategic Roadmap for Building Decarbonization and NESCAUM's Multi-State Action Plan*

The Governor's Office of Climate Action and the Green Economy developed a Strategic Roadmap for Building Decarbonization (Synapse Energy Economics, 2025), laying the framework for State agencies to reduce emissions in the buildings sector and deploy efficient heat pump technologies. Coinciding with this effort, NESCAUM published its Multistate Action Plan that provides a menu of options for states aiming to enhance the deployment of heat pump technologies in residential buildings (NESCAUM, 2025). New Jersey's State agencies should consider the plethora of recommendations outlined in these two reports, along with the enabling actions detailed in this report, to continue our collective pursuit toward building electrification and efficiency.

Enabling Action 1.14 *Require heat pump courses in the core curriculum for HVAC contractors pursuing licenses*

As heat pump adoptions increase over time, it is necessary that the workforce is knowledgeable and well-equipped with heat pump equipment installations and servicing, along with other non-heat pump HVAC technologies. The State should consider requiring heat pump courses in the core curriculum for HVAC contractors pursuing or renewing licenses, which would prepare the HVAC workforce for the anticipated heightened demand for these technologies and potentially lower costs for consumers as the heat pump labor supply develops.

Enabling Action 1.15 *Catalyze green lending capacity to electrify buildings via the New Jersey Green Bank*

The New Jersey Green Bank (NJGB) has the potential to expand its green lending capacity to further electrification efforts in the State's buildings. The NJGB's current product offering, the State Debt Product, can finance building decarbonization efforts, including the installation of building heat pumps and geothermal systems, by offering loans of \$1-20 million. Eligible borrowers for building decarbonization and building electrification project funding include private, for-profit entities, non-profits, academic institutions, municipalities and counties.

Enabling Action 1.16 *Enhance financial incentives for large-scale ground source heat pumps*

Considering the emissions and grid benefits of large-scale GSHPs and TENs increase substantially with system size, it is critical for the State to prioritize deployment in sectors where concentrated loads drive significant energy demand and infrastructure investment (NJDEP, 2023). Large commercial campuses, schools, data centers, hospitals, and public facilities represent high-value sites where electrification via TENs can produce outsized emission reductions per installation, while simultaneously deferring costly electric capacity upgrades. By shifting large heating and cooling loads to efficient thermal infrastructure, TENs can free up electric capacity for surrounding communities, reduce peak demand, and mitigate the need for new transmission and distribution investments.

To maximize these system-wide benefits, New Jersey should consider enhanced financial incentives and targeted program support for large-load GSHP and TEN installations, particularly within the networked confines of overburdened communities and municipalities and in lower-to-moderate income regions highly dependent on gas heating systems. Prioritizing projects that deliver dual benefits, reduced emissions, and meaningful capacity relief will accelerate beneficial electrification, support equitable clean-energy access, and strengthen long-term reliability and affordability across the state.

Enabling Action 1.17 *Form a multistate partnership like the New England Heat Pump Accelerator to advance heat pump adoptions in the Mid-Atlantic region*

New Jersey can benefit from a multistate partnership that leverages Mid-Atlantic markets to accelerate heat pump adoption and, over time, support cost-reductions and competitive innovation in TENs in the region. As an example, the New England Heat Pump Accelerator is a multistate coalition between Connecticut, Maine, Massachusetts, New Hampshire, and Rhode Island, with the goal of expanding the availability of heat pumps across the Northeast region by streamlining incentive and training offerings across participating States, partnering with manufacturers, distributors and installers, and investing in workforce development and consumer outreach initiatives (Connecticut Department of Energy and Environmental Protection, 2025). New Jersey can pursue a similar collaborative approach with Mid-Atlantic peers, such as Delaware, Maryland, New York, Pennsylvania, Virginia, Washington, DC and West Virginia, to build market scale, strengthen the supply chain, and advance consumer and contractor awareness.

As the TENs market matures and foundational utility-led pilots advance in both the New England and Mid-Atlantic markets, coordinated regional collaboration could also help support the emergence of a more competitive developer and installer marketplace, driving innovation, reducing upfront deployment costs, and expanding access to thermal networks across a wider range of communities and building types.

Table 2.4. Measure 1 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Implement and expand upon the NJBPU's Triennial programs	Ongoing	NJBPU
Develop an energy advisor navigator or guide for energy customers seeking electrification and energy efficiency improvements	Ongoing	NJBPU, Energy Utilities
Develop education and outreach materials and training and apprenticeship programs on heat pumps for residential and commercial stakeholders	Near-Term	NJBPU, NJDEP, NJDOL, NJEDA, Energy Utilities
Work with utilities to launch building decarbonization start up programs and additional demonstration "pilot" projects surrounding thermal energy networks	Near-Term	NJBPU, Energy Utilities
Develop a renewable heating and cooling web calculator tool for New Jersey	Near-Term	NJBPU
Develop a ground source heat pump feasibility tool for New Jersey stakeholders and update the ground source heat pump baseline report	Near-Term	NJDEP, NJBPU
Establish phased pathways for large-scale thermal energy networks, beginning with utility-led pilots and supporting future community-scale deployment	Near-to-Mid-Term	NJBPU, NJDEP, Energy Utilities
Explore continuation of NJBPU's Higher Education Decarbonization Pilot Program	Ongoing	NJBPU
Phase out and eliminate programs that incentivize fossil fuel equipment replacements	Ongoing	NJBPU, Energy Utilities
Require tenant protections for building owner participation in incentive programs	Ongoing	NJBPU, Energy Utilities
Consider rate reform to encourage electrification and demand flexibility while improving equity	Near-Term	NJBPU
Establish long-term statewide heat pump targets	Near-Term	NJBPU, NJDEP
Implement the Governor's Office Strategic Roadmap for Building Decarbonization and NESCAUM's Multi-State Action Plan	Ongoing	All State Agencies
Require heat pump courses in the core curriculum for HVAC contractors pursuing licenses	Ongoing	Legislature, NJDOL
Catalyze green lending capacity to electrify buildings via the New Jersey Green Bank	Ongoing	Legislature, NJEDA
Enhance financial incentives for large-scale ground source heat pumps	Ongoing	NJBPU, Energy Utilities

Form a multistate partnership like the New England Heat Pump Accelerator to advance heat pump adoptions in the Mid-Atlantic region

Near-to-Mid-Term

NJDEP, NJBPU

Table 2.5. Measure 1 Implementation Approach.

Plan to Leverage Funds

Cost of Measure

Medium-High

Secured Funding

New Jersey will continue to support building decarbonization efforts through its existing ratepayer funded pools of money such as the [societal benefit charge \(SBC\)](#), state appropriations, regional greenhouse gas initiative proceeds, and by targeting federal grants. New Jersey has secured the following funds towards partial implementation of this measure and its enabling actions:

- [State-Based Home Energy Efficiency Contractor Training Grant](#) funds to develop a contractor training program.
- NJBPU has dedicated state funding to develop the clean heating and cooling tool, geothermal demonstration projects, the [Higher Education Decarbonization Pilot Program](#), [Community Energy Plan Grant](#) (CEPG) and [Community Energy Plan Implementation](#) (CEPI) Grant programs.
- RGGI funds are dedicated to the NJ Cool pilot program and the NJ Green Bank
- NJ Clean Energy Loans are funded via the US Treasury's State Small Business Credit Initiative
- [Inflation Reduction Act \(IRA\) Home Electrification and Appliance Rebates Program](#)
- [IRA Home Efficiency Rebates Program](#)
- [State Energy Program](#) funds are invested towards the NJCEP program
- The NJEDA's Green Workforce Training Grant Challenge provides funding for workforce development initiatives aiming to advance the green economy
- IRA funds the Training for Residential Energy Contractors Program

All these actions are considered partially funded and would benefit from additional funding.

Funding gaps + opportunities

All enabling actions described in this measure would benefit from additional funds. More funding would allow New Jersey to expand and implement all enabling actions on a wider scale, achieving deeper decarbonization and heat pump adoptions. Some funding opportunities for heat pump advancements include:

- [EPSCoR Research Infrastructure Improvement Program: EPSCoR Collaborations for Optimizing Research Ecosystems](#)
- [Spurring Projects to Advance Energy Research and Knowledge Swiftly \(SPARKS\)](#)

New Jersey will continue to pursue additional federal funding opportunities as they become available to build upon the State's heat pump advancements.

Geographic Scope

Statewide

Authority to Implement

Subject to further legal review:

- NJBPU and energy utilities have existing authority to implement energy efficiency programs (P.L. 2018, c.17, 2018).
- NJDEP has broad authority to implement policies and programs to prevent, control, and prohibit air pollution throughout the State, including programs of education (N.J.S.A. 13:1D-9, 2024; N.J.S.A. 26:2C-1, 2024).
- NJDOL has the authority to implement training certification programs and courses, and issue licenses and permits (N.J.S.A. 34:15B-35, 2024; N.J.S.A. 34:5A-38, 2024).
- NJEDA has the authority to implement programs via (N.J.S.A. 34:1B-1, 2024).

Metrics for Tracking Progress

New Jersey will continue to track total energy consumption within the building sector as one metric for evaluating the success of implementing this measure. Additionally, as documented in EO 316, the NJBPU is required to track and annually report on Statewide building decarbonization efforts. NJBPU intends to set up a process for the Statewide tracking of disbursement of federal funds for building decarbonization. Other State agencies will be required to report back to the NJBPU for this effort. Further, NJDCA was directed to develop a system to track building rehabilitation and new construction projects that incorporate electric building space heating and cooling and water heating systems and provide the information to the NJBPU.

Emissions Reduction Measure 2: Adopt a Clean Heat Standard

Through EO 317 and the USCA Commitment, the NJBPU was directed to consider a Clean Heat Standard (CHS) regulation, which would target emission reductions directly from heating energy utilities by requiring them to replace oil, natural gas, and propane heat with clean heat over time (Exec. Order No. 317, 2023; USCA, 2023). A CHS does not specify a particular technology or approach but can act to support technology-specific strategies like Measure 1, Heat Pump Adoption. In that sense, these measures work together, and their benefits are not strictly additive. However, in combination, they provide additional certainty with respect to future emissions reductions.

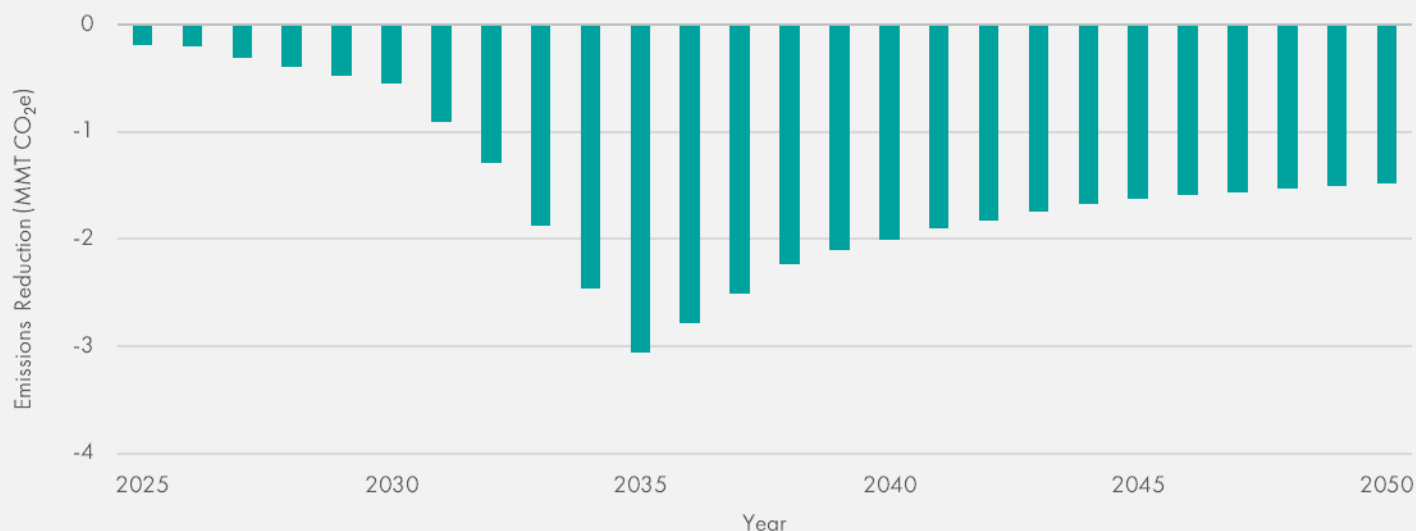
Under a CHS policy, energy utilities that provide natural gas, oil or propane for heating purposes are required to meet minimum emission reduction targets by implementing clean heat alternatives. The expectation of a CHS is that the targeted energy utilities will adopt and implement measures to accelerate energy efficiency, decrease peak demand, encourage fuel switching and boost building electrification. Although a CHS policy does not currently exist in New Jersey, other states have either implemented one or are undergoing development of a CHS, including Massachusetts, Vermont, Colorado, and Maryland (Commonwealth of Massachusetts, 2022; Regulatory Assistance Project; SB21-264, 2021; Vermont Public Utility Commission, 2024). Notably, the CHS policies introduced in these states are not identical. Some CHS policies target only gas distribution companies instead of all thermal fuels, and some permit credit generating and trading that aid in compliance with a CHS. Notwithstanding, setting an appropriate design for a CHS is an important determining factor of its effectiveness in reducing emissions, calling on the need to ensure flexibility, include robust monitoring and enforcement, and align with climate goals and existing carbon pricing mechanisms (Rosenow, et al., 2025). Considering New Jersey is in the early stages of evaluating the role of a statewide CHS, there is an opportunity to learn from other states that are enacting a CHS and determine an optimal policy design that enhances the State’s efforts of achieving its climate goals and accelerating clean heat statewide.

Measure Quantification

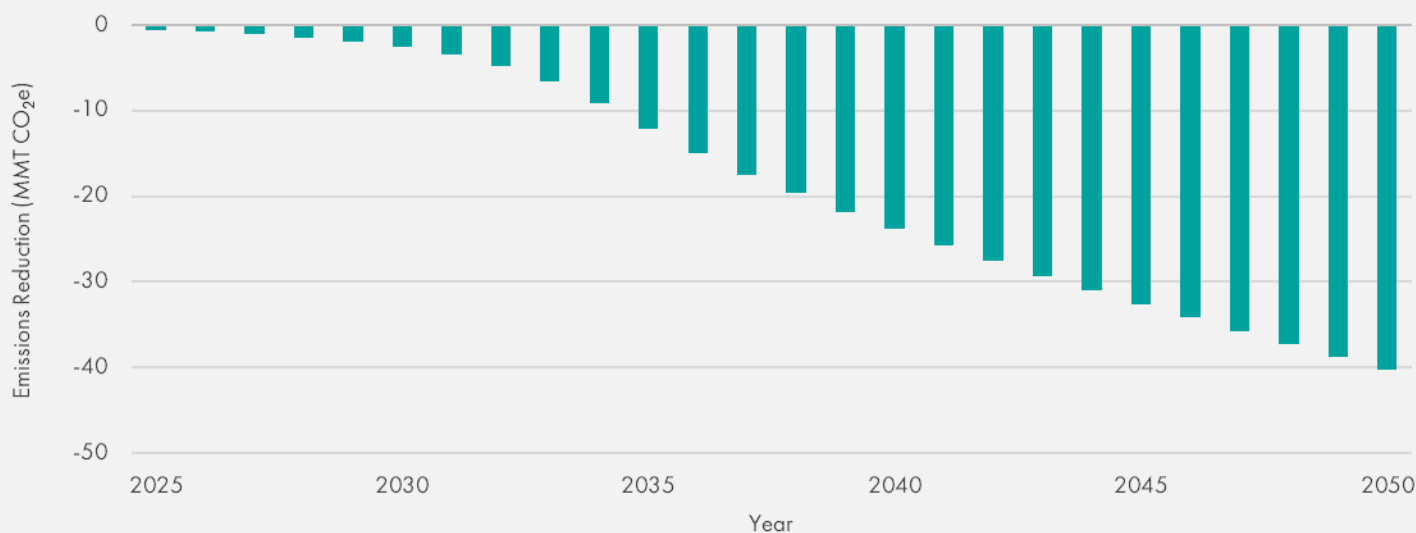
The CHS policy was modeled to establish emissions caps relative to 2021 baseline emissions: 1% in 2027, 4% in 2030, and 22% in 2035 and beyond. For analysis purposes, the caps were applied to emissions from natural gas and distillate fuel oil in the residential and commercial sectors. When compared to current policies, combined emission reductions from adopting a CHS policy under Measure 2 in both residential and commercial sectors were projected to reduce emissions by 0.6 MMT in 2030, 3.1 MMT CO₂e in 2035, and 1.5 MMT CO₂e in 2050 (Figure 2.21). Since current policies will result in gradual reductions in GHG emissions but the CHS as modeled stops descending from 2035, the added benefit of the CHS decreases approaching 2050. As modeled, cumulative emissions reductions totaled 2.6 MMT CO₂e in 2030, 12.2 MMT CO₂e in 2035, and 40.2 MMT CO₂e in 2050 (Figure 2.22).

Figure 2.21. Annual Emissions Reductions from Measure 2, Clean Heat Standard, Compared to Current Policies.

Estimated annual emission reductions are shown through 2050 based on a Clean Heat Standard adopted under Measure 2.

**Figure 2.22. Cumulative Emissions Reductions from Measure 2, Clean Heat Standard, Compared to Current Policies.**

Estimated cumulative emission benefits are shown through 2050 based on a Clean Heat Standard adopted under Measure 2.



Priority Enabling Actions

NJDEP has identified five critical actions necessary to support the development of a CHS in New Jersey.

Enabling Action 2.1 *Establish a heating fuel reporting rule*

To help understand baseline information about heating fuel providers, the State should establish a heating fuel reporting rule that requires heating providers to report monthly heating fuel delivery data on a quarterly basis. New Jersey can consider a similar procedure to Massachusetts Heating Fuels Emissions Reporting Regulation (310 CMR 7.71, 2024) and Maryland's Heating Fuel Provider Reporting Program (Maryland Department of the Environment, 2025), where the data collected from heating fuel providers also informs State's GHG emissions inventories. As a result, New Jersey-specific data can inform a baseline performance and help establish credit holding requirements for a CHS.

Enabling Action 2.2 *Evaluate and adopt a Clean Heat Standard*

Initiating a CHS Advisory Group comprised of pertinent State agency offices and key stakeholders should be the first step the State considers prior to introducing the policy. Following a similar process to Vermont’s Technical Advisory Group and Equity Advisory Group, New Jersey can ensure that all stakeholder voices inform the process of developing a CHS (30 V.S.A. 8129, 2024; 30 V.S.A. 8128, 2024). Further, the State should evaluate policy design options to ensure optimal outcomes. First, the State will need to determine the lead agency; for example, the CHS introduced in Massachusetts and Maryland is administered by their environmental agencies (Commonwealth of Massachusetts, 2022; Regulatory Assistance Project), while Vermont and Colorado administer the CHS by their utility commission (Vermont Public Utility Commission, 2024; SB21-264, 2021). Secondly, the scope of the CHS regulation and nature of obligation will need to be determined, specifying the targeted utilities and standards for emission reductions or electrification. For example, Vermont’s CHS targets retail sellers of all thermal fuels, while Colorado’s CHS targets only major gas distribution companies. Lastly, the CHS evaluation study should consider equity and the environment and incorporate feedback from stakeholders and the Clean Heat Standard Advisory Board. After careful consideration of the evaluation study results, the NJBPU or NJDEP should adopt a CHS that clearly defines GHG emission thresholds and eligible clean heating technologies. The regulation should establish goals for emission reductions and incorporate monitoring and evaluation mechanisms to ensure compliance.

Enabling Action 2.3 *Develop tools to assist with building electrification plans*

While energy utilities are expanding the amount of electricity distributed to buildings, the NJBPU and energy utilities should consider developing tools that would assist them in identifying optimal locations for deploying distributed energy resources that would not result in adverse impacts to the grid. One example includes an integrated distribution system planning tool, which strategizes electric and gas system requirements to meet the State’s climate goals while accounting for future modernized grid systems, energy demands, and technological advancements (USDOE, 2023).

Enabling Action 2.4 *Expand research and development initiatives for energy efficiency and clean heat technologies*

As heating utilities are moving toward cleaner heat over time, there is a need for enhanced research and development initiatives. By providing funding to researchers and developers, the State can stay up to date with the latest heating technology innovations and potentially introduce them as viable alternatives to equipment using natural gas and delivered fuels.

Enabling Action 2.5 *Implement the relevant enabling actions from Measure 1 regarding financing mechanisms to spur further heat pump adoptions*

As the emissions standards for heating utilities become more aggressive over time, it will be essential for energy utilities to ensure their customers can transition to cleaner heating sources in an affordable and equitable manner. Measure 1 outlined several pathways for financing heat pump adoptions and should be highly considered as supplemental actions to a CHS, if adopted.

Table 2.6. Measure 2 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Establish a heating fuel reporting rule	Near -Term	NJDEP, NJBPU
Evaluate and adopt a Clean Heat Standard	Near-to-Mid-Term	Legislature, NJDEP, NJBPU, Energy Utilities
Develop tools to assist with building electrification plans	Near-to-Mid-Term	NJBPU, Energy Utilities
Expand research and development initiatives for energy efficiency and clean heat technologies	Ongoing	NJBPU, NJEDA

Implement the relevant enabling actions from Measure 1 regarding financing mechanisms to spur furthered heat pump adoptions	Ongoing	NJBPU, Energy Utilities, NJEDA
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Table 2.7. Measure 2 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
Medium-High
Secured Funding
New Jersey has not secured funding that directly targets a CHS.
Funding gaps + opportunities
All enabling actions described in this measure would benefit from additional funds to initiate the process of implementing a CHS. Existing funding opportunities that could be leveraged to expand and continue these programs include: Spurring Projects to Advance Energy Research and Knowledge Swiftly (SPARKS) New Jersey will continue to pursue federal funding opportunities as they become available to build upon these efforts.
Geographic Scope
Statewide
Authority to Implement
Subject to further legal review: - NJDEP has broad authority to implement policies and programs to prevent, control, and prohibit air pollution throughout the State (N.J.S.A. 13:1D-9, 2024; N.J.S.A. 26:2C-1, 2024), but may need to obtain legislative authority to implement a CHS . - The NJBPU has the authority to explore the development of a Clean Heat Standard (Exec. Order No. 317, 2023), but may need to obtain legislative authority to introduce and implement a CHS. - NJEDA has the authority to implement programs via (N.J.S.A. 34:1B-1, 2024).
Metrics for Tracking Progress
Tracking the progress of these enabling actions would include heating fuel sales and consumption data reported by heating fuel providers, the number of applicants and participants in the programs, number of energy efficient technologies and products installed, energy savings, cost savings, and GHG emissions.

Emissions Reduction Measure 3: Upgrade building envelopes

Building electrification coupled with envelope improvements ensures that buildings operate safely, reduces energy consumption and helps guarantee costs savings to building owners and operators. Improving the efficiency of a building can occur by upgrading the barrier of a building that separates it from indoor and outdoor conditions, referred to as the building envelope. Adding thermal insulation and making other improvements to the building, like air sealing, window upgrades, and ventilation and moisture control upgrades, can reduce heat loss and more efficiently control heating, cooling, and ventilation within the building. Energy efficiency improvements are firmly established as among the most cost-effective strategies available for reducing fossil fuel consumption and resulting GHG emissions (Molina & Kiker, 2019; Optimal Energy, 2019). Tying in building envelope upgrades with other electrification tactics, like heat pump installations, can have a more profound impact on energy cost savings and emission reductions.

Under the Current Policy Scenario, no building envelope retrofits would occur, and only new construction would comply with the latest building codes. The CCAP Scenario calls for significant upgrades to New Jersey's existing building stock, with building envelope retrofits of 59% for existing residential and 72% for commercial buildings by 2050 and 10% of low-to-moderate income properties electrification-ready. This averages out to a goal of 2.0% of the residential housing stock, or 64,000 residential units, each year between 2025 and 2050 (Figure 2.23); and an average of 2.5% of the commercial floor space, or 67 million square feet per year during that same time period (Figure 2.24).¹¹

Figure 2.23. Cumulative Number of Residential Retrofits under Measure 3.

Under Measure 3, the cumulative number of basic and enhanced retrofits in the residential sector will rise to about 1.2 million and 0.4 million homes, respectively, by 2050.

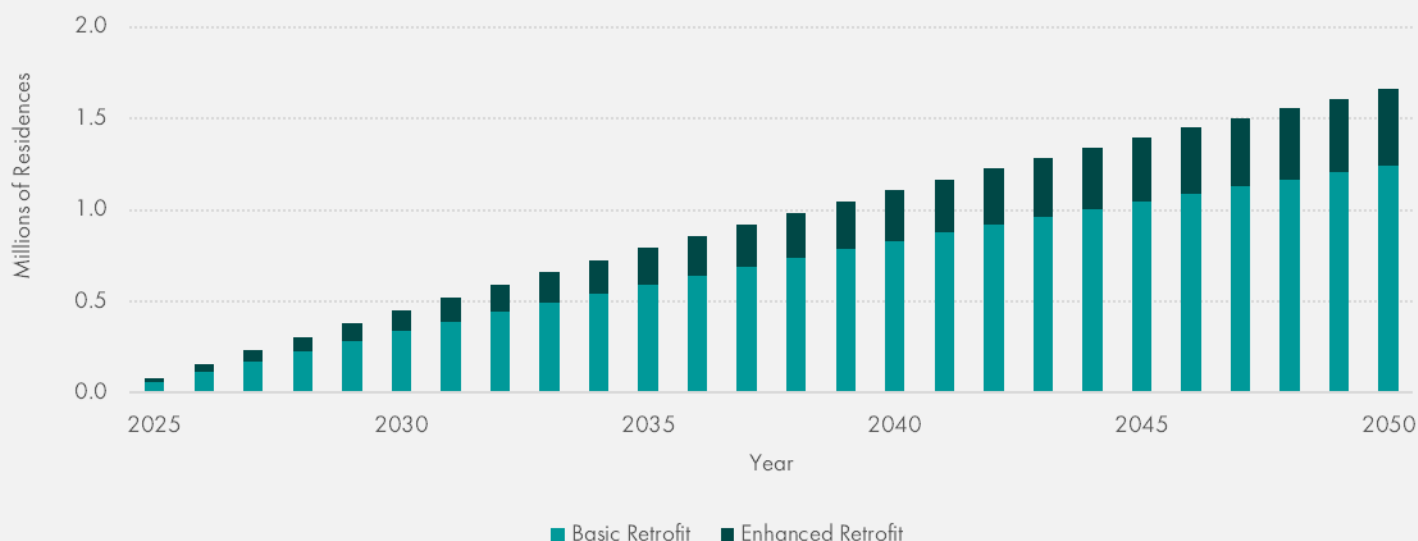
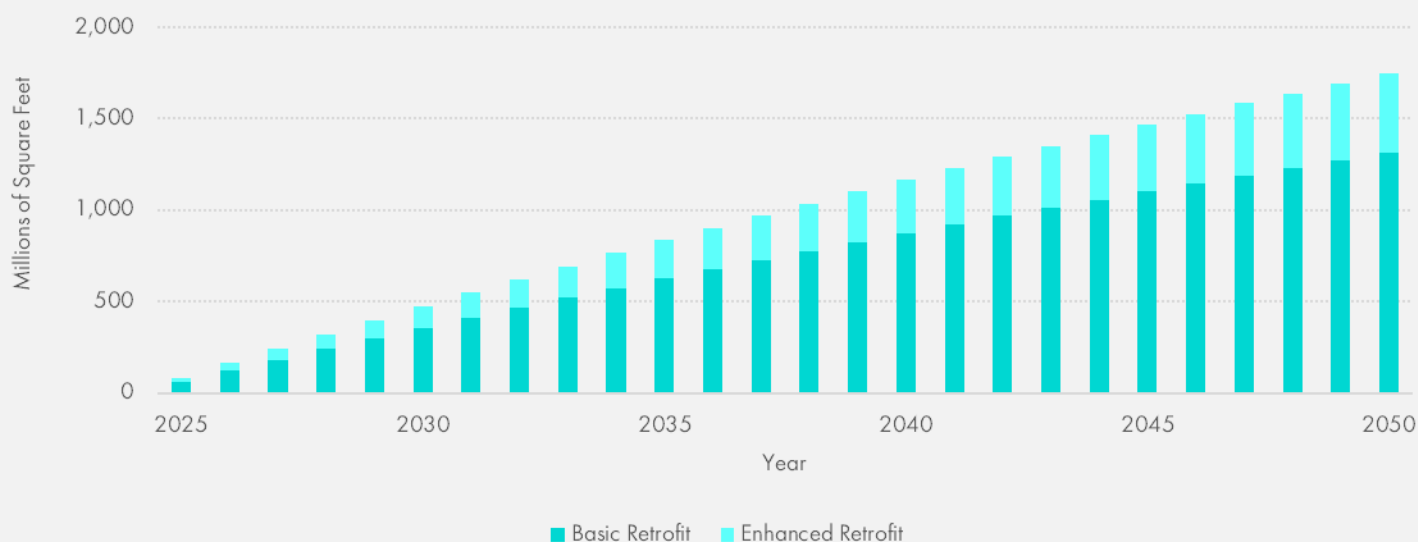


Figure 2.24. Cumulative Commercial Retrofits under Measure 3, by Square Feet of Floor Space.

Under Measure 3, the cumulative number of basic and enhanced retrofits in the commercial sector will rise to about 1.3 billion and 436.8 million square feet of floor space, respectively, by 2050.



¹¹ Basic retrofits include upgrades such as replacement windows, weather sealing, and increased insulation in accessible areas. Enhanced upgrades consist of more extensive renovations such as wall and siding improvements. Basic retrofits are expected to reduce heating loads 32% and air conditioning loads 13%. Enhanced retrofits are expected to reduce heating loads 38% and air conditioning loads 16%. Implementation was modeled on (Nadal & Ungar, 2019) as described in the 2025 NJ EMP.

Measure Quantification

Building on current policies, modeling indicates that achieving the retrofit goals outlined in the CCAP Scenario can reduce residential and commercial emissions by 0.8 MMT CO₂e by 2030, 1.4 MMT CO₂e by 2035, and 2.3 MMT CO₂e by 2050 (Figure 2.25). Cumulative avoided emissions can total 3.0 MMT CO₂e by 2030; 8.8 MMT CO₂e by 2035, and 38.4 MMT CO₂e by 2050 (Figure 2.26).

Figure 2.25. Annual Emissions Reductions from Measure 3, Building Envelope Upgrades above Current Policy Levels.

Estimated annual emission benefits are shown through 2050 based on building envelope upgrades pursued under Measure 3.

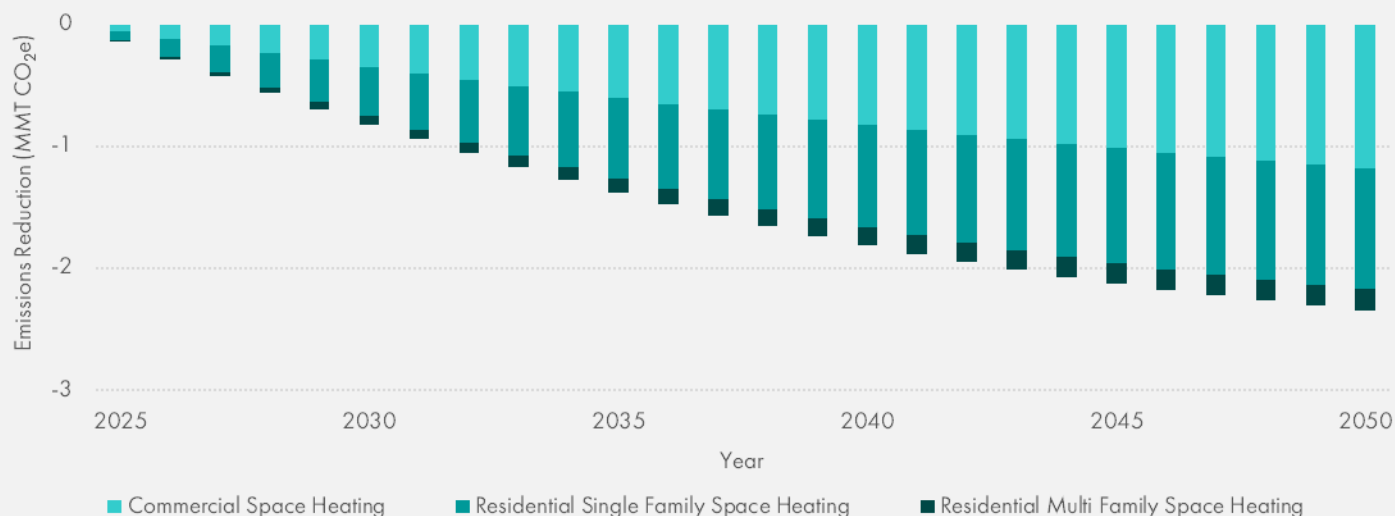
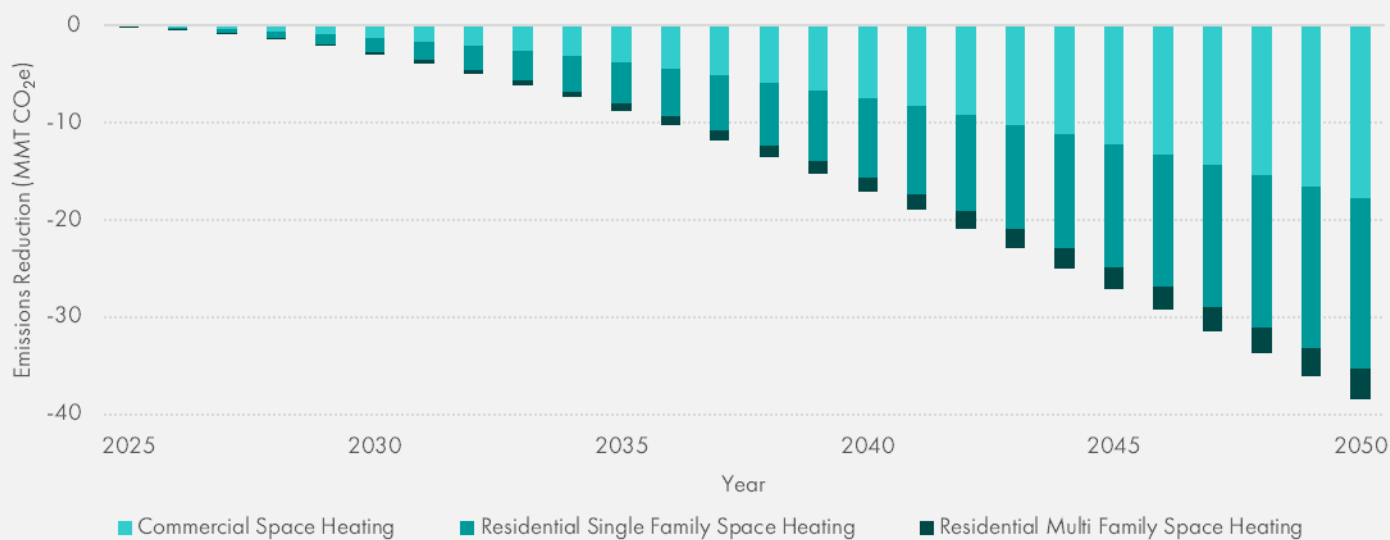


Figure 2.26. Cumulative emissions reductions from Measure 3, Building Envelope Upgrades above Current Policy Levels.

Estimated cumulative emission reductions are shown through 2050 based on building envelope upgrades pursued under Measure 3.



Priority Enabling Actions

Expanding the number of building retrofits will be achieved through a range of tactical policies and programs that facilitate implementation. NJDEP has identified six initial enabling actions to jumpstart this effort.

Enabling Action 3.1 *Provide resources to building owners, operators, and occupants to help audit their building's energy usage*

The first step towards achieving emissions reductions from the building sector is through energy audits. Energy audits provide building owners, operators, and occupants with an understanding of current energy use and the associated carbon footprint. A comprehensive energy audit will identify energy conservation measures, energy efficiency practices and on-site generation options. Building owners, operators, and occupants will need to implement suggested improvements to achieve emissions reductions. Once the identified measures are implemented, emissions reductions can be measured and verified. Modifying the heating and cooling systems of buildings when they are being renovated or retrofitted can provide increased energy efficiency and thermal comfort, while creating safer and healthier living or workspaces.

As building owners, operators, and occupants grapple with choices about adopting more energy efficient and electrified technologies, there is a need to develop and disseminate resources to these energy customers that inform them of the benefits of auditing their building's energy use, the process to audit, and best practices for implementing energy efficiency enhancing measures. Additionally, energy utilities should continue offering energy audits to customers as a supplement to these resources.

Enabling Action 3.2: *Focus on opportunities to increase efficiency in the least efficient buildings, with a focus on low- to moderate-income households*

Energy utilities should use available data to identify and reach out to customers whose buildings have the most opportunities for improvements in energy efficiency, electrification, and peak demand reduction. For example, energy utilities currently provide home energy reports to residential customers and can use the data in these reports to follow up with customers who live in the most inefficient buildings and offer them financial incentives for upgrades, with a focus on reducing utility bills of LMI customers. Financial incentives can be designed to attract buildings that have the greatest opportunities for improvements. For example, the higher the level of energy and demand savings, the higher the level of financial incentive that would be offered. Utilities should also offer education and information, as well as potentially financial incentives, to landlords of LMI tenants about the benefits of these building improvements for tenants and properties.

Enabling Action 3.3 *Embed building envelope upgrades in utility programs aimed at electrification and other clean energy technologies*

Energy utilities currently offer a plethora of incentives aimed at deploying energy efficiency in buildings, conducting whole home energy assessments and implementing upgrades. Given that energy efficiency plays a crucial role in lowering energy demand and costs, there is a need to continue to embed building envelope upgrade incentives in existing utility program offerings aimed at electrification and to do the same if utility program offerings expand to include or facilitate referrals for other clean energy technologies such as energy storage and renewable electric generation.

Enabling Action 3.4 *Explore a disclosure or reporting requirement of building energy labeling and energy efficiency at point of sale*

Documenting a building's overall energy performance, or energy use intensity, is referred to as energy labeling. By requiring the disclosure or reporting of a building's energy label, particularly at point of sale, sellers can enhance transparency of their building's performance and potentially encourage other building owners to reduce their energy use intensity and boost their building's efficiency. Buildings labeled more efficient can command higher rents, have lower vacancy rates, and result in higher property values.

Enabling Action 3.5 *Offer targeted programs to enable building envelope and energy efficiency upgrades in low- and moderate-income residential buildings*

Prior to introducing energy efficiency and electrification upgrades, it is necessary for a building to have stable and safe conditions to host the upgrades. As such, the State should consider programs that target a 'whole house' approach as a pre-requisite for installing energy efficient appliances and HVAC equipment to ensure optimal conditions for energy

savings. ‘Whole house’ refers to a holistic approach to healthy housing, incorporating, and coordinating energy efficiency improvements while remediating health and safety hazards that pose a threat to human health and too often cause efficiency upgrade work to be deferred or delayed. These hazards include water intrusion, mold, asthma triggers, asbestos, radon, slip-and-fall risks, pests, electrical deficiencies, lead-based paint, lead service lines, and other existing toxins and contaminants.

One example is New Jersey’s Whole House pilot program, which provide coordinated weatherization, health, safety, and energy efficiency interventions to low-and moderate-income residents (Green & Healthy Homes Initiative, 2022). The State piloted the Whole House program in Trenton, New Jersey, with partners including PSE&G and CMC (PSE&G’s Comfort Partners implementer). Moving forward, the NJBPU and energy utilities should consider adopting a similar approach to the Whole House pilot program by either introducing a new statewide incentive program aimed at enhancing building envelopes and health and safety measures or weaving these measures into existing energy efficiency and building decarbonization programs.

Enabling Action 3.6 *Continue implementing the NJ COOL Program and RETROFIT NJ Pilot Program*

The NJEDA should continue dedicating funds to building decarbonization projects that incorporate building envelope upgrades. One example is the NJ COOL Program, which funds building electrification and other actions targeting energy efficiency and the reduction of operating emissions, like building envelope improvements, in overburdened communities. Further, the NJEDA Board approved the RETROFIT NJ Pilot Program, using \$75 million of RGGI funds, which will provide grants for large-scale retrofits for buildings pursuing energy efficiency and renewable energy upgrades.

Table 2.8. Measure 3 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Provide resources to building owners, operators, and occupants to help audit their building’s energy usage	Near -Term	NJDEP, NJBPU
Focus on opportunities to increase efficiency in the least efficient buildings, with a focus on low- to moderate-income households	Near -Term	NJBPU, Energy Utilities
Embed building envelope upgrades in utility programs aimed at electrification and other clean energy technologies	Ongoing	NJBPU, Energy Utilities
Explore a disclosure or reporting requirement of building energy labeling and energy efficiency at point of sale	Near -Term	Legislature
Offer targeted programs to enable building envelope and energy efficiency upgrades in low-and moderate-income residential buildings	Ongoing	NJBPU, Energy Utilities
Continue implementing the NJEDA’s NJ COOL Program and RETROFIT NJ Pilot Program	Ongoing	NJEDA

Table 2.9. Measure 3 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
Medium
Secured Funding

New Jersey will continue to support building envelope upgrade efforts through its existing ratepayer funded pools of money such as the [societal benefit charge \(SBC\)](#), state appropriations, regional greenhouse gas initiative proceeds, and via targeting federal grants. New Jersey has secured the following funds towards partial implementation of this measure and its enabling actions:

- NJBPU has dedicated state funding to the [Higher Education Decarbonization Pilot Program](#), [Community Energy Plan Grant](#) (CEPG) and [Community Energy Plan Implementation](#) (CEPI) Grant programs.
- RGGI funds are dedicated to the NJ Cool pilot program, the NJ Green Bank, and RETROFIT NJ program.
- NJ Clean Energy Loans are funded via the US Treasury's State Small Business Credit Initiative
- [IRA Home Electrification and Appliance Rebates Program](#)
- [IRA Home Efficiency Rebates Program](#)
- [State Energy Program](#) funds are invested towards the Whole House Pilot Program
- Funds from the [USDOE Weatherization Assistance Program](#) is administered by the NJDCA to provide weatherization services to New Jersey's low income households
- The Federally funded [Low Income Home Energy Assistance Program](#) provides financial assistance to low-income households in New Jersey to undergo weatherization

Funding gaps + opportunities

All enabling actions described in this measure would benefit from additional funds. More funds would allow New Jersey to expand and implement all enabling actions on a wider scale, achieving deeper decarbonization. The State has applied to or intends to apply to several federal grants to support its ongoing building decarbonization efforts, including, but not limited to the:

- [EPSCoR Research Infrastructure Improvement Program: EPSCoR Collaborations for Optimizing Research Ecosystems](#)

New Jersey will continue to pursue federal funding opportunities as they become available to build upon these efforts.

Geographic Scope

Statewide

Authority to Implement

Subject to further legal review:

- NJBPU and energy utilities have existing authority to implement energy efficiency programs (P.L. 2018, c. 17, 2018).
- NJDEP has broad authority to implement policies and programs to prevent, control, and prohibit air pollution throughout the State, including programs of education (N.J.S.A. 13:1D-9, 2024; N.J.S.A. 26:2C-1, 2024).
- NJEDA has the authority to implement programs via (N.J.S.A. 34:1B-1, 2024).

Metrics for Tracking Progress

Key metrics for tracking building envelope upgrades include the number of participants in the programs, the number of customers rejected from participating in energy efficiency programs due to inadequate building conditions, the number of energy efficient technologies and products installed, energy savings, cost savings, and GHG emissions.

Emissions Reduction Measure 4: Establish all-electric building codes

In the case of new construction, design decisions lock in future emissions, and it is much less expensive to “design for zero-emissions” at the outset than it is to retrofit later at much greater cost. However, developers responsible for initial construction may focus more on initial cost, without consideration for GHG emissions and their impact on climate, in order to remain competitive in their markets. This in turn can cause building owners to ultimately lose out on the potential benefits of greater energy efficiency and lead to greater climate degradation due to avoidable emissions.

All-electric building codes establish definitive requirements that create certainty and level the playing field for both developers and investors. Owners and users of buildings constructed under such codes also have the assurance that

their operations are consistent with long-term climate objectives, without the need to evaluate the specifics of a building's construction and performance. Adopting an all-electric code early in the energy transition process can therefore achieve sizeable cumulative emissions reductions over a building's long lifetime. However, introducing an all-electric building code in New Jersey requires legislative action.

For context, the current construction codes are established under the New Jersey State Uniform Construction Code (UCC) Act, which was signed into law in 1975. This Act authorizes the Commissioner of the New Jersey Department of Community Affairs (NJDCA) to adopt and enforce rules pertaining to construction codes and provides for the administration and enforcement of those rules throughout the State. The Uniform Construction Code (N.J.A.C. 5:23), which was promulgated in 1977, contains the UCC Act and all rules issued under the Act relating to the administration and enforcement of construction regulations. The UCC is comprised of multiple technical subcodes for construction, such as building, electrical and energy. These and other subcodes set the baseline standard for construction utilizing national model codes. The UCC and the model codes are product-neutral for all items to be utilized for installation. The model codes are not to be superseded other than what is permitted in the Act. Legislative action would be necessary to authorize the NJDCA to modify the UCC to purposely exclude certain products and installation methods in order to establish all-electric building codes.

At present, the NJDCA has adopted the latest building codes for residential and commercial buildings, the 2021 IECC and ASHRAE 90.1-2019 (N.J.S.A. 5:23-3.18, 2022; N.J.S.A. 5:23-3.16, 2022). The IECC regulates minimum energy conservation requirements for new buildings and addresses energy uses in both residential and commercial construction, including heating, ventilation, lighting, water heating and power usage for appliances. As additional provisions to the 2021 IECC, the NJDCA also adopted the optional solar-ready and net-zero appendices that grant municipalities the option to require new building projects to construct above-code. Due to the latest adoptions of these building codes, it is expected that 13,540 additional jobs would be created in the State over 30 years (USDOE, 2021). Moreover, the latest codes are estimated to save New Jersey's residents \$278 and commercial properties \$143 each year (USDOE, n.d.). NJDCA is also actively working towards adoption of the 2024 IECC which, if finalized, is estimated to reduce energy usage an additional 6.8% compared to the 2021 code (USDOE, 2024a).

Coupling climate action with building codes has been an ongoing state effort, with the initiation of the Energy Code Collaborative (ECC) in 2021 where New Jersey, Northeast Partnerships for Energy Efficiency, and other key stakeholders explore zero energy building policies and their potential role in the State (NJ Energy Code Collaborative, n.d.). The ECC is informed by an advisory committee, with three energy code subcommittees focusing on new construction, existing buildings, and workforce and compliance. In 2025, the ECC released a draft report on achieving zero energy buildings, with pertinent considerations when pursuing building code modifications and direct policy recommendations to achieve zero energy buildings (NEEP, 2025). One approach to enacting all-electric code requirements would be to offer municipalities the opportunity to adopt them at their own discretion, potentially coupled with incentives. In this case, requirements would only apply within the municipality's jurisdiction. Related measures such as support for on-site renewable energy and purchase of off-site renewable energy could be incorporated into the package to lower costs and significantly reduce GHG emissions.

An advantage of an opt-in structure is that the interests of the community can shape the decision to adopt such a code and the details of the adopted provisions. On the other hand, this approach would lose some of the "level playing field" advantage of a statewide requirement and could create a patchwork of regulatory standards across communities. As a general consideration, an opt-in approach could best suit the current needs of the State and allow details of how such programs can be structured for wider applications to be worked out. Later in the energy transition, as electrified design becomes the norm rather than the exception, such codes could be applied statewide. However, this phased approach would take longer to close off construction of fossil-fuel dependent buildings and would incur future retrofit costs.

As an example of a mandatory all-electric building code, New York adopted the All-Electric Buildings Act in 2025 as part of their recent code update, requiring almost all newly constructed buildings¹² to have electric appliances and equipment starting January 1, 2026; larger, newly constructed buildings have an extended compliance date starting

¹² Applies to newly constructed buildings that are seven stories or less.

December 31, 2028 (New York Assembly, n.d.). Under New York's all-electric code, existing buildings are not required to transition to all-electric and have the option to remain on fossil fuels.

Implementing an all-electric building code in New Jersey has the potential to result in significant emission reductions. For current context, of New Jersey's residential buildings in 2020, 11% are all electric, 3% use heat pumps for primary heating, and 16% use electricity for primary space heating (USEIA, 2023a). With respect to commercial buildings, a profile of structures in the Mid-Atlantic region (New Jersey, New York and Pennsylvania), only 13% were all-electric (USEIA, 2023b). These fully electrified commercial buildings also tended to be small, with fewer than half exceeding 5,000 square feet of floor space. Of all commercial buildings, 17% used electricity as their primary heating source, 51% used natural gas, 15% fuel oil, and 11% were unheated. The clear dependency on fossil fuels for space heating and low number of all-electric buildings throughout the State highlight the necessity for an all-electric building code to help spur cleaner and healthier buildings statewide.

Measure Quantification

Applying an all-electric new construction code in the residential and commercial sectors would result in annual GHG emissions reductions of 1.3 MMT CO₂e by 2030; 2.6 MMT CO₂e by 2035, and 6.5 MMT CO₂e by 2050 (Figure 2.27). Cumulative emissions for the combined sectors would be reduced by 3.9 MMT CO₂e by 2030; 14.3 MMT CO₂e by 2035; and 84.7 by 2050 (Figure 2.28).

Figure 2.27. Annual Emissions Reductions Due to All-Electric Building Code for New Construction (MMT CO₂e).

Estimated annual emission benefits are shown through 2050 based on the adoption of an all-electric building code under Measure 4.

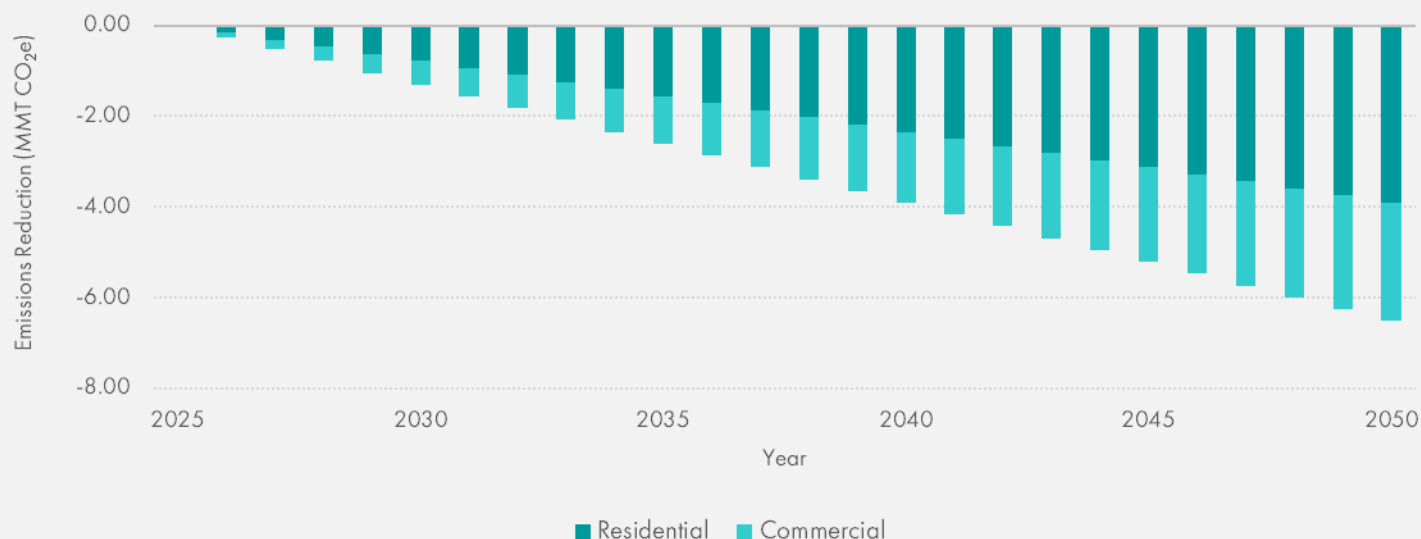
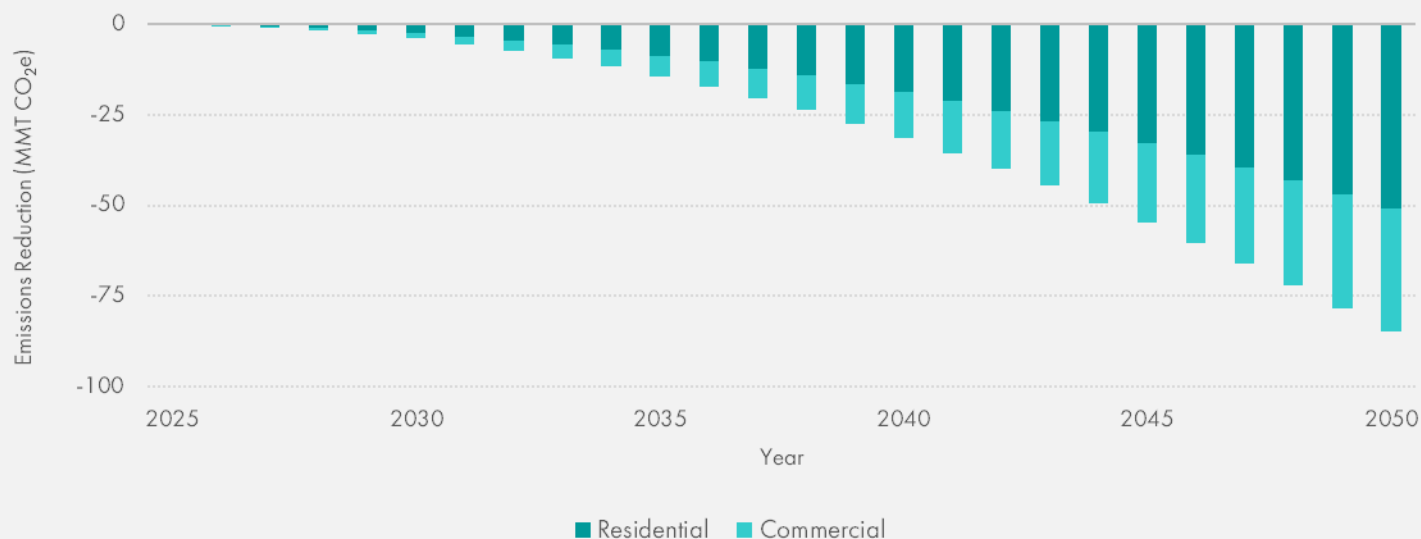


Figure 2.28. Cumulative Emissions Reductions Due to All-Electric Building Code for New Construction (MMT CO₂e).

Estimated cumulative emission reductions are shown through 2050 based on the adoption of an all-electric building code under Measure 4.



Priority Enabling Actions

NJDEP has identified eight critical actions necessary to support the development of an all-electric building code.

Enabling Action 4.1 *Adopt the 2024 International Energy Conservation Code for residential buildings and ASHRAE 90.1-2022 for commercial buildings*

One major instrument to increase building electrification and energy efficiency across the State is the timely adoption of building energy codes, such as the IECC and ASHRAE 90.1. Building energy codes serve as key climate mitigation tools, working to reduce building-level energy use, energy related costs, and greenhouse gas emissions (Schwarz, Nakhle, & Knoeri, 2020). They establish minimum standards for energy efficiency across various aspects of building design and technologies, encompassing the building envelope, HVAC systems, lighting, and water heating. New Jersey can continue to show leadership in building codes by adopting the 2024 IECC for residential new construction and ASHRAE 90.1-2022 for commercial new construction as the next base codes for the State. These model codes will provide a significant boost towards improved efficiency of the built environment. According to estimates from the Pacific Northwest National Laboratory (PNNL), the 2024 IECC and ASHRAE 90.1-2022 could reduce energy use by 7.8% and 14.4%, respectively, compared to the currently adopted codes in New Jersey (PNNL, 2024). The 2024 IECC alone could reduce energy use intensity, energy costs, and emissions, each by an average of 8% compared to the 2021 IECC (PNNL, 2024).

Enabling Action 4.2 *Consider adopting an all-electric building code to maximize energy efficiency in new construction*

A stretch code is a non-mandatory alternative compliance path that is more aggressive than the base code, allowing communities to accelerate greenhouse gas reductions and energy efficiency from new construction. In preparation for a potential all-electric building code in New Jersey, the State should research options and evaluate potential impacts. Considerations should be given to the legislative requirements of the State's UCC (N.J.S.A. 52:27D-119, 2022), and lessons learned from other states implementing an all-electric base code, like New York. After evaluating the effectiveness of adopting an all-electric building code in New Jersey, the State may consider legislation to allow the adoption of the all-electric code to maximize electrification and energy efficiency in new construction. If adopted, New Jersey can build upon the work of the Clean Buildings Work Group (Synapse Energy Economics, 2025) and the New Jersey ECC (NJ Energy Code Collaborative, n.d.) to consider pairing the rollout with incentives to encourage municipal and builder adoption.

Enabling Action 4.3 *Explore requiring all public housing and State-funded buildings to construct buildings to all-electric standards*

To enhance the construction of all-electric buildings and lead by example, the State should require all State-funded buildings and public housing projects to construct to all-electric standards. The State can provide financial incentives to initiate the transition.

Enabling Action 4.4 *Revise the rehabilitation subcode to require major retrofit projects to comply with an all-electric building code*

The all-electric building code could be enforced for major retrofits and rehabilitation projects, in addition to newly constructed buildings, if found viable to do so. To permit this, the State could revise the rehabilitation subcode for existing buildings to require major retrofit projects to comply with an all-electric building code.

Enabling Action 4.5 *Create guidelines and resources for relevant stakeholders complying with an all-electric building code*

The NJDCA is currently considering optional appendices to the IECC, particularly zero net energy, stretch codes, and electric-ready building provisions for new construction. If adopted, it is crucial for the State to provide stakeholders deciding to comply with the optional appendices with guidelines and resources to effectively and proficiently construct buildings in compliance with the code. New Jersey's Housing and Mortgage Financing Agency (NJHMFA) Technical Services Division provides guidance and technical assistance to New Jersey's development community that utilize their financing programs, like the Energy Benchmarking Technical Manual for building managers following nationally recognized industry building standards (NJHMFA, n.d.) and the Green Guide for participants in the Low-Income Housing Tax Credit program (NJHMFA, 2023).

For additional resources targeting building developers and designers, one example for consideration is New York's Sustainability Building Guidelines, which include guidelines for new construction, existing buildings, and projects undergoing repairs and renovations (NY Homes and Community Renewal, 2025). A second example is Philadelphia's Performance Systems Development team that developed easily digestible guidance documents and forms tailored to design and construction professionals based on industry-specific credentials, with the goal of helping them more easily understand and apply the energy code (City of Philadelphia, n.d.). Expanding similar resources in New Jersey could also increase participation in the State's clean energy and energy efficiency programs, as the wide dissemination of comprehensive guidance materials can lead to heightened awareness of the incentives across construction professionals. State agencies should collaborate on this action, potentially leveraging NJBPU's New Construction Program for development and distribution of these guidelines and resources.

Moreover, New Jersey can develop tools and resources for building owners to help them comply with the all-electric building code. Some resources currently being developed by New York (New York Assembly, n.d.) that can be applied to New Jersey include a dedicated webpage explaining how the all-electric code works, facts and myths documentation, guidance on how to go electric, and graphics and videography that residents can share on social media.

Enabling Action 4.6 *Adopt the latest National Electrical Codes*

The National Electrical Code (NEC) establishes standards for electrical installations in buildings and is updated on a three-year cycle by the National Fire Protection Association (NFPA) (NFPA, 2025). The latest edition is the 2023 NEC, which has an increased focus on renewable energy, energy storage systems, EV infrastructure, energy efficiency and safety enhancements. The NJDCA adopted the 2020 NEC with some amendments in 2022 (NFPA, 2025). The NJDCA is considering adopting the latest NEC codes as part of the next cycle of IECC and ASHRAE model code adoptions. The next NEC update is expected in 2026. NJDCA should continue adopting the latest NECs moving forward as the State continues its pursuit of building electrification and efficiency.

Enabling Action 4.7 *Expand incentives for all-electric appliances and equipment*

The State should continually offer incentives for all-electric appliances and equipment, as discussed in Measure 1, and consider enhanced incentives to ensure that the technology requirement provisions outlined in an optional code for all-electric provisions can be met.

Enabling Action 4.8 *Mandate energy code courses in the curriculum for licensing programs*

Energy code courses are currently voluntary for code officials and contractors undergoing the State's licensing program. As building electrification efforts continue to ramp up, the NJDCA should make energy code courses a requirement and part of the core curriculum.

Table 2.10. Measure 4 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Adopt the 2024 International Energy Conservation Code for residential buildings and ASHRAE 90.1-2022 for commercial buildings	Near -Term	NJDCA
Consider adopting an all-electric building code to maximize energy efficiency in new construction	Near -Term	NJDCA, Legislature, NJDEP
Explore requiring all public housing and State-funded buildings to construct buildings to all-electric standards and potential funding opportunities to initiate it	Near -Term	Legislature, NJDCA
Revise the rehabilitation code to require major retrofit projects to comply with an all-electric building code	Near -Term	Legislature, NJDCA
Create guidelines and resources for relevant stakeholders complying with an all-electric building code	Near-to-Mid-Term	NJHMFA, NJDEP, NJDCA, NJBPU
Adopt the latest National Electrical Codes	Near -Term	NJDCA
Expand incentives for all-electric appliances and equipment	Ongoing	NJBPU, Energy Utilities
Mandate energy code courses in the curriculum for licensing programs	Ongoing	Legislature, NJDCA

Table 2.11. Measure 4 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
Low
Secured Funding
New Jersey will continue to support building decarbonization efforts through its existing ratepayer funded pools of money such as the societal benefit charge (SBC) , state appropriations, regional greenhouse gas initiative proceeds, and via targeting federal grants. New Jersey has secured the following funds towards partial implementation of this measure and its enabling actions:
• Resilient & Efficient Codes Implementation Grant funds under two applications by ACEEE and ASHRAE/IECC to support code related enabling actions. • The NJDEP and NJDCA have committed staff resources toward the release of an appliance standards report and ongoing adoption of the latest IECC and ASHRAE building codes. • RGGI funds are dedicated to the NJ Cool pilot program and the NJ Green Bank

- NJ Clean Energy Loans are funded via the US Treasury's State Small Business Credit Initiative
- [IRA Home Electrification and Appliance Rebates Program](#)
- [IRA Home Efficiency Rebates Program](#)
- [State Energy Program](#) funds are invested towards the NJCEP program

Funding gaps + opportunities

All enabling actions described in this measure would benefit from additional funds. More funds would allow New Jersey to adopt an all-electric building code and provide adequate financial incentives to equitably advance cleaner buildings statewide. The State has applied to or intends to apply to several federal grants to support its ongoing building decarbonization efforts, including, but not limited to the:

- [Building Codes Implementation for Efficiency and Resilience](#)
- [EPSCoR Research Infrastructure Improvement Program: EPSCoR Collaborations for Optimizing Research Ecosystems](#)

New Jersey will continue to pursue federal funding opportunities as they become available to build upon these efforts.

Geographic Scope

Statewide

Authority to Implement

Subject to further legal review:

- NJDCA is authorized to adopt the latest edition of the national model code every three years as the statewide standard; see (N.J.S.A. 52:27D-119, 2022). but cannot supersede this standard, thus an all-electric stretch code at the local level is the only option unless there is a legislative change.
- NJBPU and energy utilities have existing authority to implement energy efficiency programs (P.L. 2018, c.17, 2018).
- NJDEP has broad authority to implement policies and programs to prevent, control, and prohibit air pollution throughout the State, including programs of education (N.J.S.A. 13:1D-9, 2024; N.J.S.A. 26:2C-1, 2024).

Metrics for Tracking Progress

Establishing all-electric building codes will involve the following metrics for tracking progress: building energy usage and sources via the State's benchmarking program, number and type of heating equipment installed, number of participants in programs, energy savings, cost savings, and GHG emissions.

Emissions Reduction Measure 5: Adopt statewide Building Performance Standards

Benchmarking is an important step toward reducing energy consumption in buildings and is an effective means to inform and motivate building owners to undertake energy efficiency improvements. Building energy benchmarking uses data to measure how efficiently a building performs over time and enables comparison between similar buildings. As an indicator of energy performance, benchmarking can drive up demand for energy efficiency.

Existing law in New Jersey requires energy benchmarking in commercial properties of 25,000 square feet or greater (P.L. 2018, c.17, 2018). As an extension to this law, building performance standards (BPS) could set either energy use intensity or greenhouse gas emission reduction standards for large commercial buildings greater than 25,000 square feet. If designed appropriately, a BPS policy can result in high rewards, with potential energy savings between 25% and 45% and a 10-to-20-year payback period for implementing energy conservation measures (Webb & McConnell, 2023). As one example of a jurisdiction adopting a BPS policy, New York City's Local Law 97 (LL97) set emissions limits for buildings greater than 25,000 square feet starting in 2024 and ramping up to more stringent limits in 2030 (LL97, 2019). Implementing statewide building performance standards will help further energy efficiency improvements and reduce building related emissions.

Measure Quantification

Introducing a BPS policy will require critical evaluation, including review of performance and compliance data gleaned from the existing benchmarking program. And because a BPS will touch on a wide range of stakeholder interests and economic activities, it is essential to evaluate circumstances early in the program development process. Towards that end, Rutgers University is engaged in research project on behalf of the Board of Public Utilities to explore BPS policy options and lay the groundwork for policy design (Rutgers University, 2025). Since research is ongoing, this CCAP does not attempt to quantify potential future emissions reductions from such a program, but the BPS is included in this CCAP in recognition of the commitment the State has made.

Priority Enabling Actions

NJDEP has identified four critical actions necessary to support the continuation of the benchmarking program and future introduction of a BPS.

Enabling Action 5.1 *Continue with energy benchmarking efforts and conduct data analysis and research*

New Jersey's Energy and Water Benchmarking Program requires commercial and State buildings over 25,000 square feet to benchmark their energy and water usage (NJBPU, 2022). The NJBPU anticipates developing a preliminary benchmarking report covering the 2022–2024 reporting years and the first of what is anticipated to be an annual benchmarking report starting with the 2025 reporting year. The reports would include high-level insights, building compliance rates, participation and performance metrics, trends, summary of helpdesk inquiries, and frequently asked questions. NJBPU also plans to host a stakeholder meeting after releasing the preliminary report to solicit feedback on what data and variables should be included in future annual reports. Further, the State should publish the benchmarking data as either site energy use intensity or as an Energy Star score map and conduct analyses and research into the reported data so that there is better understanding of the current energy usage, energy efficiency improvements, and compliance needs across large buildings within the State.

Enabling Action 5.2 *Evaluate optimal policy designs for a statewide Building Performance Standard*

The State should evaluate the best policy design of a BPS and determine whether it would target emissions or energy usage. The implementing agency would be determined thereafter, as the NJDEP regulates air emissions and the NJBPU regulates energy use reductions. To aid in this determination, Rutgers University Center for Urban Policy Research received funding from the USDOE's Resilient and Efficient Codes Implementation Grant to test and refine components of programs that could complement an evidence-based BPS in New Jersey and beyond. One outcome of this project includes a report with key considerations for a BPS and policy recommendations. Specifically, the project team will explore methods for improving the energy performance of existing buildings and the cost and emissions savings associated with different policy compliance pathways. The project team will also help identify the types of technical assistance, training, and workforce preparation and incentive programs building owners would need to make improvements and attain the BPS requirements.

Enabling Action 5.3 *Adopt a statewide Building Performance Standard*

Once the Rutgers University recommendation report has concluded and after careful evaluation of the study's results, the State should consider adopting a statewide BPS and determine compliance thresholds based on benchmarking data and building types. Tying in the results of prior benchmarking data analyses, the State can deploy a targeted BPS policy that buildings can easily comply with and results in great emissions benefits. As an additional consideration for the BPS, the State should set minimum energy efficiency standards for buildings with occupants most susceptible to extreme heat and indoor air pollution, like rental properties, affordable housing, and multifamily units. The State should also consider requiring rental properties to maintain a minimum energy efficiency standard and ensure that rental costs are not heightened or imposed on tenants. The State should further explore an alternative compliance pathway specific to multifamily renter occupied housing and follow New York City's GreenHOUSE Fund and Beneficial Electrification Credit as examples (NYC Accelerator, n.d.; NYC, 2024).

Enabling Action 5.4 *Develop educational and technical resources to enhance benchmarking and building performance standard compliance*

The NJBPU should enhance the existing benchmarking program's compliance via tailored resources and outreach activities to those struggling to comply with reporting. Other technical resources can be developed by the NJBPU and NJDEP, such as manuals, training and toolkits, which can assist building owners in complying with a building performance standard by providing them with best practices and checklists to achieving optimal building efficiency. One example is the Washington, DC Affordable Housing Retrofit Accelerator, which assists multifamily buildings with developing a plan to comply with the city's BPS and provides resources for building upgrades (District of Columbia Sustainable Energy Utility, n.d.). Additional resources can include educational training and pilot projects of technologies that will be necessary to comply with a BPS. Altogether, the resources should be tailored to the needs of buildings undergoing retrofits at various levels and attaining specific BPS targets, such as a building installing low-hanging fruit energy conservation measures that can occur at any point in time compared to a building pursuing more complex projects like installing TENS.

Table 2.12. Measure 5 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Continue with energy benchmarking efforts and conduct data analysis and research	Ongoing	NJBPU, NJDEP
Evaluate optimal policy designs for a statewide Building Performance Standard	Near-Term	Rutgers University, NJBPU, NJDEP
Adopt a statewide Building Performance Standard	Near-Term	NJDEP or NJBPU
Develop educational and technical resources to enhance benchmarking and building performance standard compliance	Near-to-Mid-Term	NJBPU, NJDEP

Table 2.13. Measure 5 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
Low
Secured Funding
New Jersey has secured the following funds towards partial implementation of this measure and its enabling actions: - Rutgers University secured funding via USDOE's Resilient and Efficient Codes Implementation Grant to evaluate and recommend an optimal BPS policy in New Jersey. State Energy Program funds are invested towards the Energy and Water Benchmarking Program
Funding gaps + opportunities
All enabling actions described in this measure would benefit from additional funds. More funding would allow New Jersey to expand and implement all enabling actions on a wider scale, achieving deeper decarbonization. Some funding opportunities for heat pump advancements include: EPSCoR Research Infrastructure Improvement Program: EPSCoR Collaborations for Optimizing Research Ecosystems Spurring Projects to Advance Energy Research and Knowledge Swiftly (SPARKS) New Jersey will continue to pursue federal funding opportunities as they become available to build upon these efforts.
Geographic Scope

Statewide

Authority to Implement

Subject to further legal review:

- The NJBPU has the authority to implement the existing energy benchmarking program.
- Depending on the focus of the building performance standard, either the NJDEP (GHG emission focus) or NJBPU (energy use focus) would implement the regulation, and the NJBPU could enforce the BPS as an extension of the benchmarking program. If the BPS policy focuses on reducing GHG emissions, the NJDEP has broad authority to implement it under (N.J.S.A. 13:1D-9, 2024; N.J.S.A. 26:2C-1, 2024). The NJBPU would need legislation providing the authority to implement.

Metrics for Tracking Progress

Metrics to consider include building energy usage and sources via the State's benchmarking program reporting, number and type of efficient equipment and appliances installed, number of participants in programs, energy savings, GHG emissions, and benchmarking compliance rates.

Emissions Reduction Measure 6: Adopt Zero Emissions Standards for space and water heating

Introducing healthy air standards for space and water heating equipment is one measure that can have a major impact on emission reductions in the State. Zero emission heating equipment standards (ZEHES), for example, require manufacturers, distributors, retailers, and installers for residential and commercial buildings to meet NO_x and GHG emission standards for furnaces, boilers, and water heaters. The ZEHES targets newly installed, pre-owned, or refurbished equipment in both existing and new construction buildings.

In 2024, NESCAUM published its ZEHES Model Rule, which serves as an initial reference point for states seeking to limit pollution from space and water heating (NESCAUM, 2024b). The model rule calls for NO_x limitations on new and rebuilt hot water heaters below a certain heat input limit beginning one year after rule adoption. Starting January 2029, the model rule also requires zero NO_x and GHG emissions from smaller furnaces and boilers as well as the applicable hot water heaters. The rule would not apply to other gas appliances such as ranges, ovens, clothes driers, or pool heaters, nor would it apply to existing equipment. As older equipment is being replaced over time, the ZEHES would phase out fossil-powered equipment in these categories unless they could meet the emissions standards.

Measure Quantification

The ZEHES emissions analysis demonstrates the importance of complementary actions. Early steps such as incentive programs and the CHS encourage adoption of clean alternatives early in the transition process. The ZEHES, in contrast, will be most effective during the last decade of the energy transition, from 2040 to 2050, when old but long-lasting space and water heating systems finally reach the ends of their serviceable lives. In this way, the ZEHES acts on the back end to close out emissions remaining after early, front-end interventions like the CHS and incentive programs have established clean technologies as the prevailing standard. Introducing a ZEHES is projected to reduce emissions by 0.2 MMT CO₂e in 2030, 0.3 MMT CO₂e in 2035, and 6.1 MMT CO₂e in 2050 when compared to emissions reductions from the Current Policy scenario (Figure 2.29). By 2050, aging units finally reach the ends of their serviceable lives, resulting in heightened emissions reductions in the long-term. The small residual tail of fossil-fueled equipment remaining in service after 2050 would essentially be replaced in the following decade, terminating emissions from this equipment category. The cumulative emissions reductions under the ZEHES compared to the current policy scenario would be 0.9 MMT CO₂e in 2030; 2.2 MMT CO₂e in 2035, and 40.2 MMT CO₂e in 2050 (Figure 2.30). A ZEHES in combination with other policies will assure effective emissions reductions under a range of future conditions.

Figure 2.29. Additional Annual Emissions Reductions from a ZEHES Compared to Emissions under Current Policies.
Estimated annual emission reductions are shown through 2050 based on the adoption of a ZEHES under Measure 6.

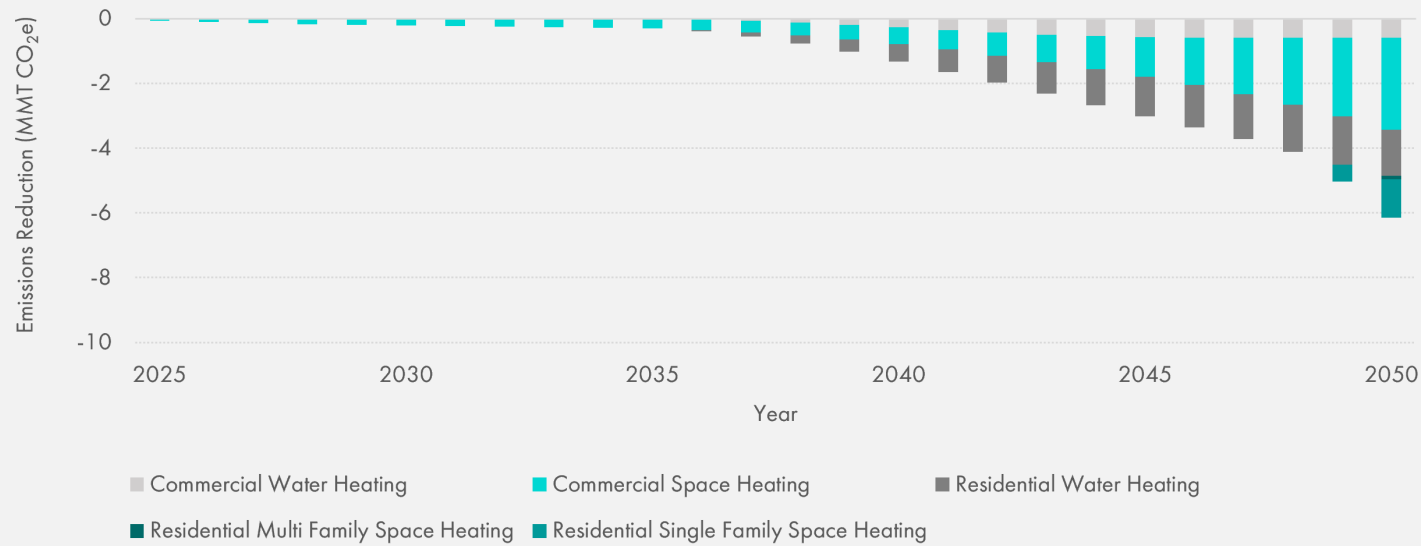
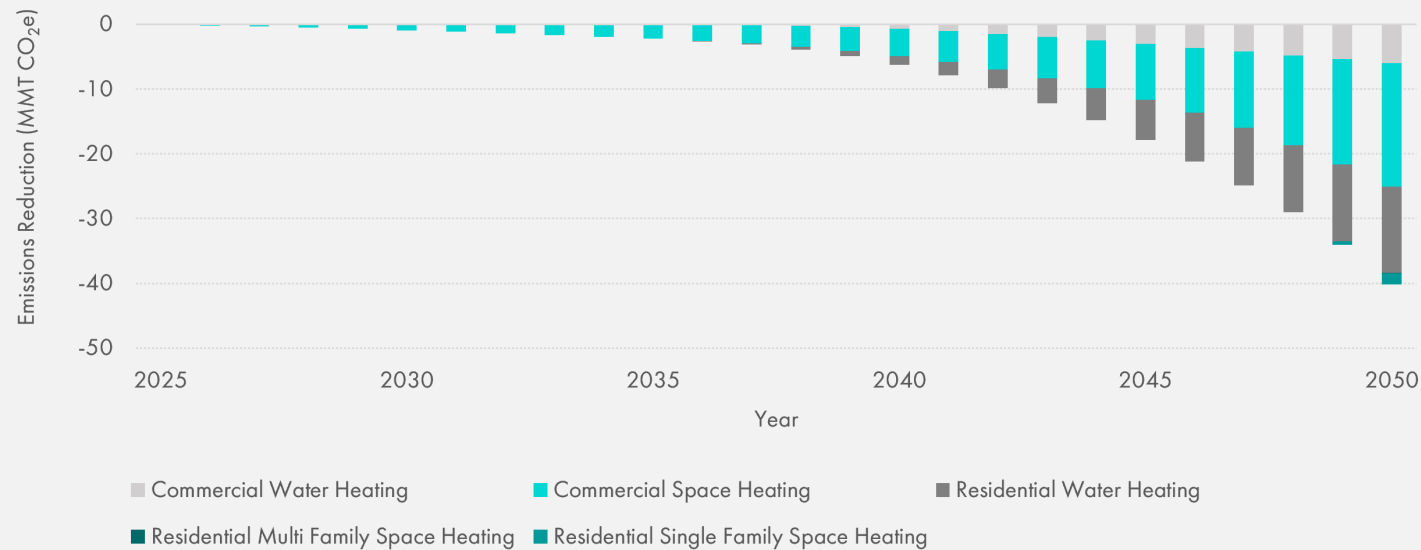


Figure 2.30. Additional Cumulative Emissions Reductions from a ZEHES Compared to Emissions under Current Policies.
Estimated cumulative emission reductions are shown through 2050 based on the adoption of a ZEHES under Measure 6.



Priority Enabling Actions

NJDEP has identified four critical actions necessary to enable the ZEHES measure.

Enabling Action 6.1 *Evaluate and adapt NESCAUM’s Zero Emission Heating Equipment Standard Model Rule to New Jersey*

The State should first engage key stakeholders, like manufacturers of heating equipment, to gauge a baseline of their capabilities to meet an anticipated heightened demand for when the standards go into effect. The State should also conduct research on the potential impacts a ZEHES would have on statewide emissions, health, and cost. Based on the outcomes of the evaluation study, the State should consider NESCAUM’s Model Rule (NESCAUM, 2024b) and

stakeholder feedback and modify the model rule accordingly to comply with New Jersey rulemaking process and regulatory authority.

Enabling Action 6.2 *Provide financial incentives and tax credits for manufacturers producing zero-carbon emission space and water heaters within the State*

As a means to accelerate the deployment of zero-emission space and water heating to meet the ZEHES, the State should consider financial and non-financial incentives, and tax credits for in-state manufacturers transitioning toward cleaner equipment production.

Enabling Action 6.3 *Develop technical resources and guidelines for equipment manufacturers, distributors and retailers*

As a supplement to the ZEHES roll-out, the State should create technical resources and guidelines for equipment manufacturers, distributors, and retailers that would aid in compliance and efficient deployment of clean heating and water heating technologies. Examples could include guidelines for heat pump contractors pursuing licenses and certifications, educational and training programs, and manufacturer engagement throughout the ZEHES adoption and implementation process.

Enabling Action 6.4 *Adopt a Clean Heating Procurement requirement for State buildings*

The State can adopt a Clean Heating Procurement mandate that requires newly constructed or majorly retrofitted State buildings to install zero emission space heating and cooling and water heating equipment that complies with the product categories outlined in NESCAUM's Model Rule (NESCAUM, 2024b). New Jersey can consider following a similar approach to Maryland's High Performance Buildings Act (SFP 3-602.1, 2024), which sets prohibitions and minimum requirements for its state procurement of heating, ventilation, and air conditioning systems.

Table 2.14. Measure 6 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Evaluate and adapt NESCAUM's Zero Emission Heating Equipment Standard Model Rule to New Jersey	Near-Term	NJDEP, Legislature
Provide financial incentives and tax credits for manufacturers producing zero-carbon emission space and water heaters within the State	Ongoing	NJBPU
Develop technical resources and guidelines for equipment manufacturers, distributors and retailers	Near-Term	NJDEP, NJBPU
Adopt a Clean Heating Procurement requirement for State buildings	Near-Term	Legislature, Treasury

Table 2.15. Measure 6 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
Low
Secured Funding
New Jersey has not secured funding that directly targets ZEHES. However, the State has secured other funding that aids in consumer adoption of building decarbonization technologies. For example, New Jersey utilizes existing ratepayer funded pools of money such as the societal benefit charge (SBC) , state appropriations, regional greenhouse gas initiative proceeds, and via targeting federal grants. Additionally, New Jersey has secured the following funds for partial implementation of this measure and its enabling actions:

- NJBPU has dedicated state funding to the [Higher Education Decarbonization Pilot Program](#), [Community Energy Plan Grant](#) (CEPG) and [Community Energy Plan Implementation](#) (CEPI) Grant programs.
- RGGI funds are dedicated to the NJ Cool pilot program and the NJ Green Bank
- NJ Clean Energy Loans are funded via the US Treasury's State Small Business Credit Initiative
- [IRA Home Electrification and Appliance Rebates Program](#)
- [IRA Home Efficiency Rebates Program](#)
- [State Energy Program](#) funds are invested towards the NJCEP program

All of these actions are considered partially funded and would benefit from additional funding, particularly when considering the inclusion of financial incentives for heat pump manufacturers and the creation of technical guidelines and resources to comply with a ZEHES.

Funding gaps + opportunities

All enabling actions described in this measure would benefit from additional funds. More funding would allow New Jersey to expand and implement all enabling actions on a wider scale, achieving deeper decarbonization. Some funding opportunities for heat pump advancements include:

- [EPSCoR Research Infrastructure Improvement Program: EPSCoR Collaborations for Optimizing Research Ecosystems](#)
- [Spurring Projects to Advance Energy Research and Knowledge Swiftly \(SPARKS\)](#)

New Jersey will continue to pursue federal funding opportunities as they become available to build upon these efforts.

Geographic Scope

Statewide

Authority to Implement

Subject to further legal review:

- NJDEP would need to obtain legislative authority to implement this measure.
- NJBPU has the authority to implement energy efficiency programs (P.L. 2018, c.17, 2018).

Metrics for Tracking Progress

Tracking progress of a ZEHES will include the following metrics: number and type of equipment installed, number of program participants, number of State agencies procuring zero emission space heating and cooling equipment, energy savings, and GHG emissions.

Emissions Reduction Measure 7: Lead by example by decarbonizing State, county and municipal resources

Government operations create GHG emissions in the same ways other sectors of the economy create them: through combustion of fossil fuels, electricity consumption (when fossil-sourced), waste generation, and many other activities. State governments and their subdivisions are therefore tasked with reducing their own emissions, and by doing so can gain valuable experience to inform their public policies as a whole. State government, in particular, can assist county and municipal governments in their climate initiatives so that emissions reductions strategies become familiar at all levels of public management.

With respect to buildings, the core goal of the program is for State and local governments to exemplify energy efficiency and electrification best practices in their real assets and thereby show other building owners throughout the State what can be done. New Jersey's Department of Treasury recently released a Circular requiring all State agencies to undergo strategic energy planning and energy benchmarking of State facilities, pursue energy audits, and introduce energy efficiency and electrification measures as part of agency capital planning (NJ Department of Treasury, 2025).

The NJDEP has taken the lead as a pilot agency for strategy development. The NJDEP has set goals to offset 100% of its electricity usage with renewable energy, starting with energy audits at all its facilities, phasing out fossil fuel equipment,

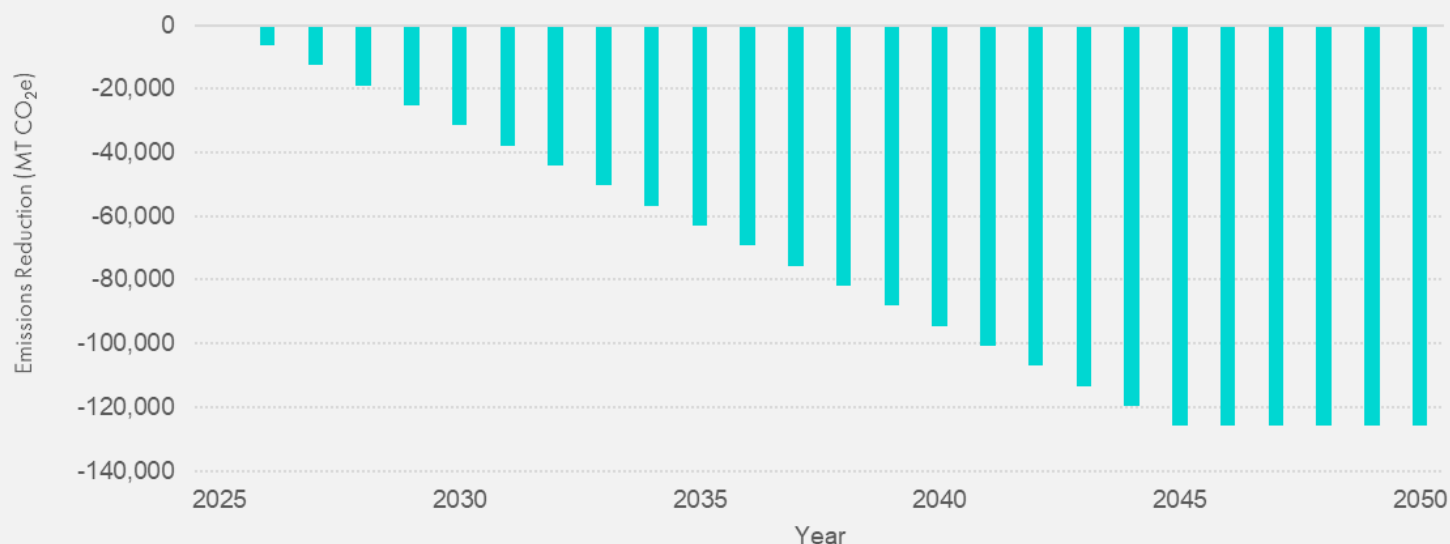
and introducing energy efficiency and conservation measures (NJDEP, 2024). As of August 2025, 40 out of 77 NJDEP facilities have audited their energy usage, with 19 more in progress (NJDEP, n.d.). Of those completed, nine facilities implemented energy conservation measures, including upgrades in lighting, HVAC systems, and water aerators (NJDEP, n.d.). Additionally, the NJDEP headquarters building installed 184 kilowatts of solar arrays on its roof. Other State and local governments have audited their energy usage under the NJCEP's LGEA program (NJCEP, 2025b). From January 2018 to July 2025, the LGEA program received 358 applicants to conduct energy audits and potentially introduce energy conservation measures (NJCEP, 2025c).

Under the LBE measure, all State government buildings would be required to perform energy audits and implement energy efficiency and electrification measures to reduce their building's emissions. Ultimately, they would be decarbonized with respect to vehicle emissions, space heating, and other fossil-sourced emissions.

Measure Quantification

Buildings administered by the Executive branch of State government provide an example of the magnitude of emissions reductions possible under the Lead by Example initiative. During fiscal year 2023, government buildings under the Executive branch consumed 2.3 trillion BTUs of fossil fuels, of which 87% was in the form of natural gas, the remainder being distillate fuel oil and propane.¹³ This consumption resulted in 126,000 MT CO₂e of climate emissions that can be essentially eliminated through electrification. Assuming a hypothetical 2045 endpoint for electrification of these legacy applications, a cumulative emissions reduction of 2.0 MMT CO₂e could be realized by mid-century (Figures 2.31 and 2.32). Further, annual electricity consumption in the range of 450,000 MWh results in approximately 100,000 MT CO₂e of climate emissions under current grid conditions.¹⁴ Improving energy efficiency and deploying renewable power can therefore accelerate emissions reduction efforts, as will decarbonization efforts in other branches of government and in other emission sectors such as transportation.

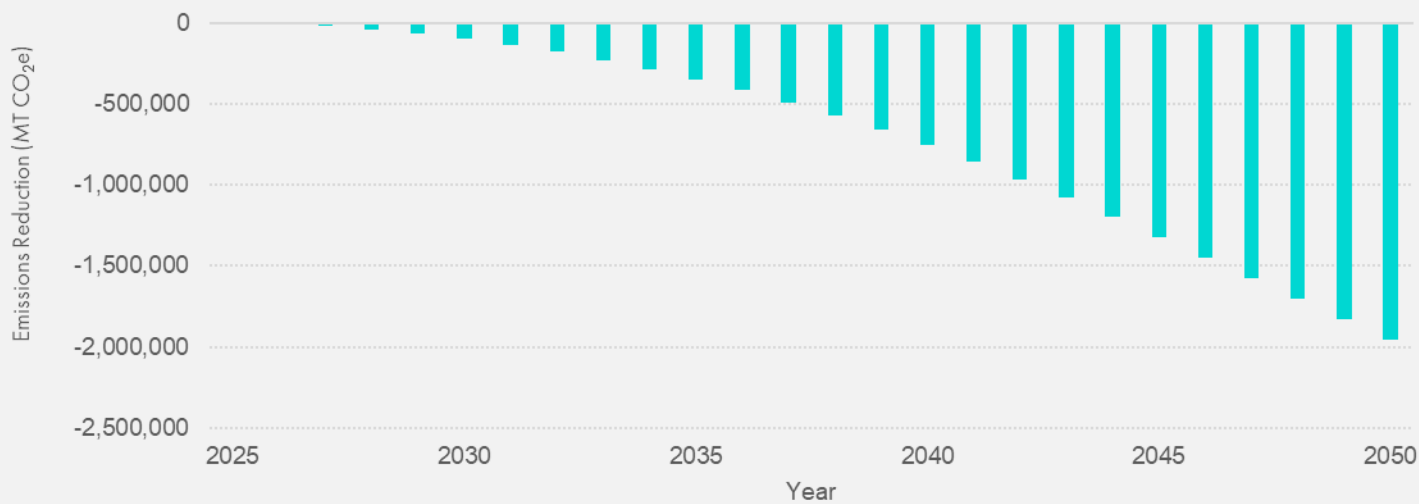
Figure 2.31. Annual Emissions Avoided by Reducing Fossil Fuel Consumption in Executive Branch Buildings Assuming a Hypothetical 2045 End Date.
Estimated annual emission reductions are shown through 2050 based on the reduction of fossil fuel consumption in Executive branch buildings under Measure 7.



¹³ Based on draft update to NJBPU (2023c) provided by NJBPU. Values for 2019-2023 ranged from 2.2 trillion to 3.1 trillion BTU. Estimates exclude government buildings not under the Executive branch such as those administered by State universities, authorities, and county and municipal governments. Estimates also do not include energy consumed by motor vehicles.

¹⁴ Based on draft update to NJBPU (2023c) provided by NJBPU. Emissions assume an emissions rate of 230 kg CO₂e/MWh, which is consistent with rates observed in New Jersey in recent years.

Figure 2.32. Cumulative Emissions Avoided by Reducing Fossil Fuel Consumption in Executive Branch Buildings Assuming a Hypothetical 2045 End Date. Estimated cumulative emissions benefits are shown through 2050 based on the reduction of fossil fuel consumption in Executive branch buildings under Measure 7.



Priority Enabling Actions

NJDEP has identified six specific enabling actions that will advance the LBE measure:

Enabling Action 7.1 *Provide resources to state and local governments to help audit their buildings’ energy usage and implement energy efficiency and electrification measures*

Building off the USDOE’s Building Decarbonization Blueprint and New Jersey’s Strategic Building Decarbonization Roadmap, the State will develop supplemental building decarbonization resources to assist local governments (USDOE, 2024b; Synapse Energy Economics, 2025). Resources may take the form of either a guidance report, scorecard, or New Jersey specific mapping tool. Specifics will be prescribed by future stakeholding on the needs of local governments.

Enabling Action 7.2 *Leverage an interagency taskforce to lead the entirety of the State’s building sector transition*

Coordination across State agencies via an interagency taskforce can create transparency with energy auditing, implementing best practices, and staying on track towards goal attainment. An interagency taskforce can ensure cohesiveness across agency program offerings for building occupants and align funding opportunities with the State’s goals. NJBPU’s Office of State Energy Services chairs the Energy Capital Committee (ECC) (NJBPU, n.d.; NJBPU, 2025b). The ECC continued the efforts of the Governor Corzine’s Executive Order on energy management for State facilities. Since 2010 the ECC has been tasked with identifying and implementing energy related capital improvement projects at State facilities and has representatives from Treasury and the NJBPU. The ECC, or a new taskforce, with expanded State agency representation, could be leveraged to discuss comprehensive building decarbonization activities, with the potential for additional subgroup meetings that delve deeper into specific building sector topics and action plans. State Energy Services currently provides agency coordination, technical assistance, and training for agency-designated energy managers across the executive branch.

Enabling Action 7.3 *Continued Implementation of the State Energy Management Circular that requires State agencies to undergo strategic energy planning*

State agencies are implementing Treasury’s State Energy Management Circular 26-05 (NJ Department of Treasury, 2025) and actively pursue energy benchmarking, audits, planning, and reporting in efforts to help the State reach its

clean energy goals. As part of the Circular, State agencies are responsible for developing Strategic Energy Management Plans and will report on their progress toward energy efficiency and meeting their GHG reduction goals. Every agency has an energy manager who is responsible for developing this plan.

Enabling Action 7.4 *Adapt similar GHG reduction targets to the US DOE Better Climate Challenge*

New Jersey can consider mandating its State agencies to adopt similar GHG reduction targets to the USDOE Better Climate Challenge (Better Buildings Solution Center, n.d.). Organizations choosing to sign up for this challenge pledge to reduce their building's emissions by 50% or more within ten years. A similar pledge in New Jersey can include energy efficiency targets, development of a State Energy Management Plan with clear GHG reduction milestones, and data reporting requirements.

Enabling Action 7.5 *Pilot building decarbonization efforts at State and local government facilities*

Decarbonizing State and local government facilities is essential for showcasing that combating climate change is attainable and a priority statewide. Government facilities and operations present a unique opportunity to incorporate energy efficiency, building decarbonization, and demand response technology, such as heat pumps. Further, decarbonizing the public sector saves money for taxpayers, supports economic development, and conveys to decision makers and the public the vital message that State and local agencies must work towards implementing energy efficient technologies, transitioning buildings away from fossil fuels, and reducing peak demand.

Enabling Action 7.6 *Expedite implementation of energy conservation measures in State government buildings*

As a supplement to NJCEP's free LGEA program (NJCEP, 2025b), municipal and county governments can leverage the Direct Install program (NJBPU, 2025c) for implementing energy conservation measures identified during the energy audit. State government agencies, however, are currently not able to utilize the Direct Install program due to procurement requirements. The NJCEP does not provide incentives for upgrades through the State Facilities Initiative and has spent over \$65 million to upgrade State buildings. Solutions for implementing energy conservation measures at State agency buildings should be expedited, including the implementation of a waiver on NJDCA permit review fees or reduced DPMC fees on energy conservation projects for State facilities.

Table 2.16. Measure 7 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Provide resources to State and local governments to help audit their building's energy usage and achieve energy efficiency and electrification measures	Near-Term	NJDEP
Leverage an interagency taskforce to lead the entirety of the State's building sector transition	Ongoing	All State Agencies
Continued implementation of the State Energy Management Circular that requires State agencies to undergo strategic energy planning	Ongoing	All State Agencies
Adapt similar GHG reduction targets to the US DOE Better Climate Challenge	Near-Term	Legislature, All State Agencies
Pilot building decarbonization efforts at State facilities and at local government facilities	Near-Term	NJBPU, Treasury, Local Governments
Expedite implementation of energy conservation measures in State government buildings	Ongoing	NJBPU

Table 2.17. Measure 7 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
Low
Secured Funding
New Jersey will continue to support lead by example efforts through State appropriations, regional greenhouse gas initiative proceeds, and via targeting federal grants. New Jersey has secured the following funds towards partial implementation of this measure and its enabling actions: • State agencies and local governments dedicate portions of their modest capital budgets to building decarbonization efforts. • RGGI funds are dedicated to the NJ Cool pilot program and the NJ Green Bank • NJ Clean Energy Loans are funded via the US Treasury’s State Small Business Credit Initiative • State Energy Program funds are invested towards the NJCEP program All these actions are considered partially funded and would benefit from additional funding.
Funding gaps + opportunities
All enabling actions described in this measure would benefit from additional funds. More funding would allow New Jersey to expand and implement all enabling actions on a wider scale, achieving deeper decarbonization. Some funding opportunities for enhancing the State’s lead by example initiatives include: • Spurring Projects to Advance Energy Research and Knowledge Swiftly (SPARKS) New Jersey will continue to pursue federal funding opportunities as they become available to build upon these efforts.
Geographic Scope
Statewide
Authority to Implement
Subject to further legal review: • The Legislature has the authority to mandate State agencies to undergo lead by example efforts. • The NJ Treasury, along with its client agencies, have existing authority to implement pilot projects at State-owned facilities pursuant to (N.J.S.A. 52:18A-3, 2024), which provides central procurement authority for client agencies, as well as the responsibility for the operation and maintenance for many State-owned facilities throughout the State. Likewise, local authorities that own facilities have the existing authority to undertake the pilot projects described in this measure.
Metrics for Tracking Progress
Tracking progress of the LBE initiative will include benchmarking data, energy savings, cost savings, and GHG emissions reduction.

STAKEHOLDER FEEDBACK

The NJDEP and other State agencies underwent an extensive stakeholder engagement process on key topics discussed in this CCAP, of which the feedback from New Jersey's stakeholders was carefully considered while writing this report. For New Jersey's Residential and Commercial sectors, general comments from stakeholders involved four broad categories: incentive and program development, education and awareness, local decision making, and workforce readiness. Overall, members of the public have expressed general support for electrification and energy efficiency measures but highlight the need for further modifications to existing programs and additional State actions, particularly involving enhanced considerations to equity, affordability, and market readiness.

Incentive and Program Development

Members of the public perceive existing electrification and energy efficiency financial incentives as inadequate to cover the high upfront costs of implementing these measures and expressed a heightened concern when regarding low-and moderate-income households. As a potential solution, New Jersey stakeholders proposed increasing home energy rebates to cover a higher amount of upfront costs and ensure program rebate amounts are connected to affordability when switching from fossil fuels to electric. Additionally, some stakeholders highlighted the difficulty renters and the multifamily sector face when attempting to pursue energy-efficiency retrofits and requested State action to ensure renter protections while landlords undergo whole home improvements. Further, the public expressed support for the State expanding its Whole House Pilot program statewide and requested more State actions to require accountability of multifamily properties, like apartment buildings, to ensure health and safety issues are addressed in addition to making improvements to its energy efficiency and electrification.

Education and Awareness

Many stakeholders expressed the need for better communication of energy efficiency and electrification opportunities, highlighting the importance of better advertising of the programs and making them easier to find. Notably, few participants of the stakeholder sessions were aware of New Jersey's electrification and energy efficiency incentive programs, including NJCEP and utility program offerings. They voiced urgency and concern about the lack of program participation, as a direct result of lack of awareness of the program, resulting in potential program cuts and loss of future funding.



"I don't have a background in science. It's important to have scientific things explained at the level for a 9-year-old." - Participant in DEP's Climate Action Community Dialogue held in April 2025



Members of the public expressed the undeniable need for enhancing awareness and outreach of incentive program opportunities, including simple best-practices guidelines for energy efficiency upgrades that residents can easily refer to and digest. Stakeholders identified the role of the NJDEP, environmental commissions and other pertinent organizations, like libraries, church groups, and senior centers, to educate the public on these incentive programs. Some members of the public identified the need for public facing tools that can easily be utilized by all residents of varying educational backgrounds, with resources on how to use the tools. Additionally, members of the public emphasized the need for enhanced education on *why* energy efficiency measures and clean energy technologies are needed overall and highlighted the importance of making sure this information is heard by all communities in the State. Supporting this sentiment, one participant stated:



"Education is not getting in to the EJ communities. When I go into homes, people have everything plugged in, and are not aware of the little, easier things that can save a lot of energy (and money). Using less electricity is a large piece of the puzzle, not just electrifying everything and hoping clean energy sources are used over fossil fuels." - Participant in DEP's South Jersey Climate Action Virtual Community Listening Session held in April 2025



As such, New Jersey residents are seeking education and outreach materials that simplify climate science concepts and are reaching all energy customers throughout the State. Many members of the public stated the need for bilingual

educational resources, for example, making materials in both Spanish and English to broaden outreach to the State's residents.



"Townships are looking for rateables. They are going against the township zoning (allowing warehouses in residential districts) in order to get rateable benefits. There could be some legislative actions the state could take to regulate this."

- Participant in DEP's South Jersey Climate Action Virtual Community Listening Session held in June 2025



Local Decision Making

As some regions of New Jersey are experiencing new warehouse and data center developments, stakeholders raised concern over limited locations for developing new affordable housing units.

Members of the public agreed that local environmental commissions should have more

decision-making power around development projects and noted that the construction of these warehouses should have on-site solar, whether on rooftops or parking lots, with potential opportunities for small, distributed energy resources that can serve the local community.

Workforce Readiness

Another key area New Jersey stakeholders provided feedback on involved workforce readiness and development initiatives. There is an optimistic consensus across New Jersey stakeholders on the outlook of green economy careers, like HVAC technicians, electricians, roofers and more, and the support for investments in workforce development training programs. Stakeholders emphasized the need for better coordination and planning between the NJ Department of Labor, union leaders, advocates, and other NJ agencies, like the NJBPU and NJDEP, particularly regarding the transition to a green workforce. One participant commented on the labor needs that are required to meet the State's ambitious climate and clean energy goals:



*"We know what to teach and we have all the tools in place... Do you know how many homes are in NJ and how many installers will be needed to make that happen? **There's a lot of potential for new good jobs.** People are saying 'we're not ready yet'... They've incentivized the companies... But we don't have the people to go out and get trained to do that job. It's the roofer that does the racking system, and it's the electrician that does that installation of the panels. **All of the homes on your block, those roofs are all going to get solar. That's a lot of opportunity to employ people.**"* - Participant in DEP's South Jersey Climate Action Virtual Community Listening Session held in April 2025



Members of the public identified the need for more paid apprenticeships, training programs in both technical and vocational schools, and career development initiatives. There was support amongst stakeholders on the idea of paying a small additional local tax that would fund expanded vocational programs at high schools, technical schools and community colleges to train youth and young adults in the skillsets needed to advance into green trade careers. Members of the public noted that employers should be required to pay for employee training and certifications, with the potential for State incentives to help alleviate the cost burden on companies. One participant noted:



"Years ago, companies used to certify employees. You didn't have to go to trade schools to get a license, companies used to pay for that. This should be considered when developing the green workforce initiatives now." - Participant in DEP's South Jersey Climate Action Virtual Community Listening Session held in June 2025



Members of the public also highlighted the need for better representation of women and residents from overburdened communities in workforce training programs, with solutions brought forth by participants to provide incentives to companies hiring these historically underrepresented groups and model a New Jersey-specific career development program after the Federal Government's Comprehensive Employment and Training Act program, which dedicates workforce development funding to low-income and young women aspiring careers in fields traditionally held by men, like construction trades. Further, stakeholders emphasized the need for workforce development initiatives to be done on a community level, with one solution involving the State providing incentives to employers for green jobs and empowering communities. Coinciding with this idea, participants agreed that there is no one-size-fits-all solution, and any model approach will need to ensure it works for all communities throughout the State.

Aligning with stakeholders' education and awareness feedback, members of the public stated the need for an information-sharing platform, like a one-stop-shop, to provide training programs, apprenticeship, and job opportunities for individuals seeking jobs or training. Additionally, members of the public recommended new marketing campaign strategies that glamorize the trades.

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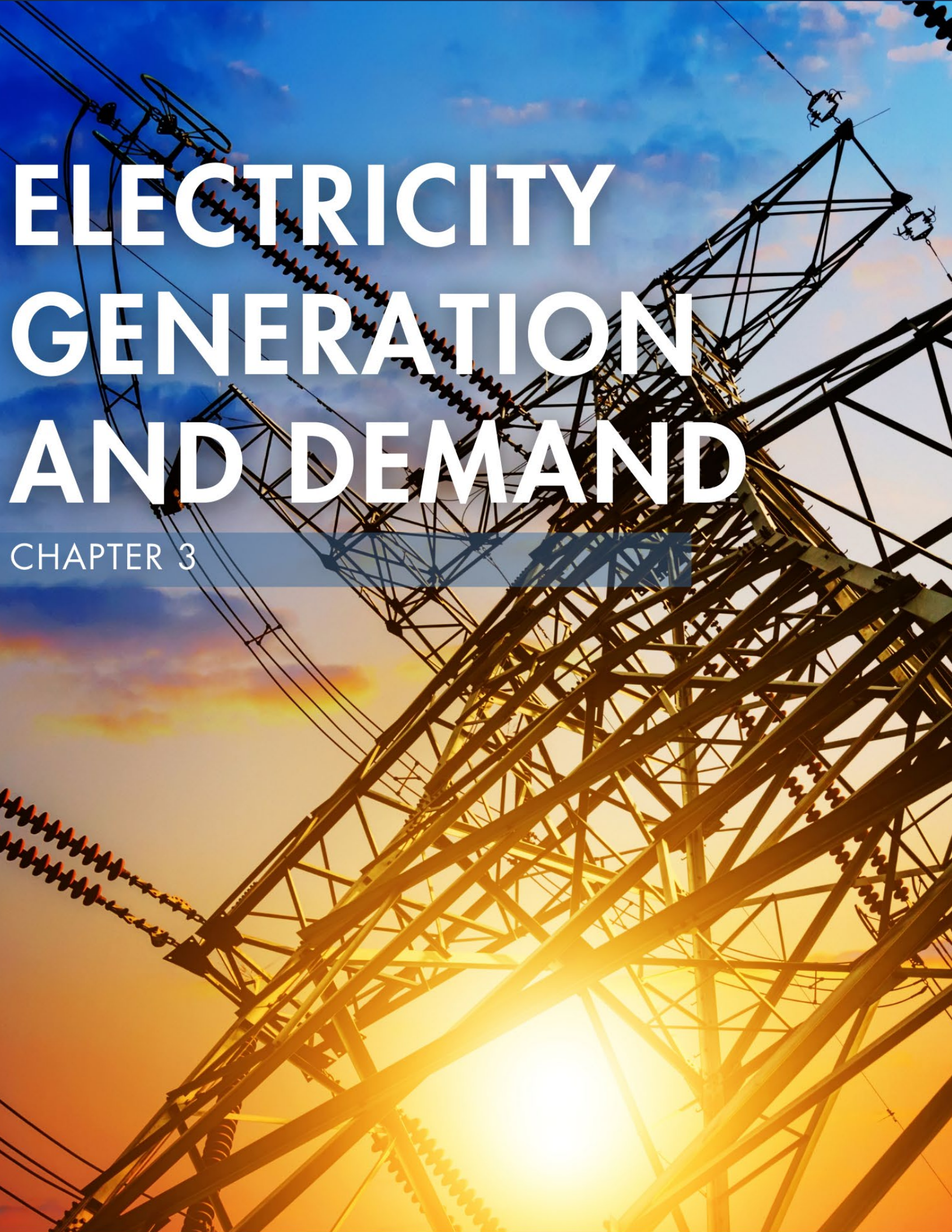
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ELECTRICITY GENERATION AND DEMAND

CHAPTER 3

ELECTRICITY GENERATION & DEMAND SECTOR SNAPSHOT

2022 NJ EMISSIONS ACTIVITIES AND DATA

Electric generation emissions are caused by combustion of natural gas, solid waste, liquid petroleum and hydrocarbon gas liquids. The electric generation sector emitted 18.1 MMT CO₂e in 2022.

- Electric generation emissions
- Total GHG emissions from all other sectors

18.1

88.6

2022 Emissions (MMT CO₂e) (GWP₁₀₀)

GHGS OF CONCERN

- Carbon Dioxide (CO₂)

EMISSIONS GOAL

6.8 MMT CO₂e

2050 EMISSIONS PROJECTIONS



GHG REDUCTION MEASURES AND ENABLING ACTIONS

Measure 1: Revise RGGI rule to conform with 2025 Program Review model rule

- 1.1 Revise New Jersey's Carbon Dioxide Budget Trading System Rule

Measure 2: Implement a 100% Clean Electricity Standard

- 2.1 Enact and Implement Clean Energy Standard Legislation

Measure 3: Reduce peak demand through adoption of electricity rate designs and policies to support load flexibility

- 3.1 Expand and accelerate adoption of time of use and time variable rate policies
- 3.2 Develop and implement strategies to support electric vehicle bi-directional charging and off-peak charge management
- 3.3 Support development and implementation of space heating and cooling energy management opportunities
- 3.4 Develop and implement Virtual Power Plant policies

Measure 4: Support continued availability of existing resources necessary for the energy transition

- 4.1 Support nuclear power plant relicensing
- 4.2 Support transition of combined-cycle natural gas resources to new operational role on the grid

Measure 5: Support development of an additional 6.2 GW solar photovoltaic capacity above amounts projected under current policies by 2050

- 5.1 Expand Solar PV under the Successor Solar Incentive (SuSI) Program
- 5.2 Expand Solar PV under the Community Solar Energy Program
- 5.3 Site solar infrastructure at State and local government facilities
- 5.4 Develop programs and policies for the years 2040 to 2050

ELECTRICITY GENERATION & DEMAND SECTOR SNAPSHOT CONTINUED

GHG REDUCTION MEASURES AND ENABLING ACTIONS

Measure 6: Continue to support the development of 11GW of offshore wind by 2040

- 6.1 Public Understanding and Engagement
- 6.2 Develop and implement transmission capacity for offshore wind
- 6.3 Support development of offshore wind capabilities at New Jersey port facilities
- 6.4 Support construction of 11 GW offshore wind

Measure 7: Support the development of 2GW of new nuclear energy generation sources by 2050

- 7.1 Engage in public outreach
- 7.2 Develop skilled-trades workforce and nuclear energy education opportunities
- 7.3 Support design process and identification of suitable sites
- 7.4 Support development of generation capacity

Measure 8: Support deployment of an additional 13.5 GW of energy storage capacity

- 8.1 Improve hosting capacity of New Jersey electric distribution system through grid modernization
- 8.2 Support implementation of FERC 2222 for distributed energy resources
- 8.3 Evaluate and, where appropriate, deploy grid supportive technologies such as Vehicle-to-Everything "V2X" and microgrid systems
- 8.4 Implement and enhance storage component of Competitive Solar Incentive program
- 8.5 Support Resilient Local Governments

Measure 9: Invest in the development of 7 GW of innovative energy technology

- 9.1 Support energy and climate education
- 9.2 Support development of new energy-related businesses related to climate mitigation and resilience
- 9.3 Apply promising new technologies to bring 7 GW of clean, firm, dispatchable power online by 2050

OVERVIEW

Electricity is unique in that it is both a suitable replacement for fossil fuels across a wide range of applications, and it also can be produced from renewable energy such as solar and wind without climate pollution emissions. Renewable energy systems offer proven alternatives that are cost-competitive, and in many cases substantially superior, to their fossil fuel counterparts. Current New Jersey planning therefore anticipates a progressive shift of energy demand away from fossil fuels and toward electricity, specifically through adoption of electric vehicles for transportation, heat pumps for space and water heating, and implementation of other rapidly evolving technologies including energy storage and fuel cells to satisfy diverse applications. The 2024 New Jersey Energy Master Plan (2024 EMP) (NJBPU, 2025a) outlines how these strategies can be applied in the State, and this chapter reviews them in the broader context of the economy-wide climate action plan.

In 2022, in-state electric generation was dominated by 33 large fossil fuel-powered facilities having nameplate capacities of 25 MW or greater. Together, these resources had a combined nameplate capacity of 13.3 GW. The State also hosted three nuclear plants totaling 3.7 GW capacity; more than 4.3 GW of solar photovoltaic capacity; and 1.0 GW of additional resources consisting of small generating stations, resource recovery centers, other renewables, and storage, for an overall total capacity of 19.0 GW. By 2025, three years later, the State's solar capacity had expanded to over 5.1 GW (NJBPU, 2025b). The State's last two coal-fired power plants also closed, saving utility customers an estimated \$30 million (Larson, 2022). And during this period a pair of simple-cycle combustion turbine facilities with high emissions rates that dated to the early 1970s retired (USEIA, 2025a).

New Jersey further relies on electricity imported from out-of-state, generally sourced through PJM Interconnection, L.L.C. (PJM), the Regional Transmission Organization. PJM operates the wholesale power markets and controls the transmission of electricity across a large portion of thirteen states and the District of Columbia. New Jersey also hosts generators that are members of the New York Independent System Operator (NYISO), directly exporting power to the New York metropolitan region independent of the PJM grid. At a larger scale, the PJM and NYISO grids belong to the Eastern Interconnection, a network spanning from the western Great Plains south to Florida, and northward to Canada, but excluding Texas and Quebec.

There are also fossil-powered, behind-the-meter electrical generators in the State that are connected directly to an industrial, commercial or institutional facility. The emissions that result from such dedicated power generators are associated with the specific sectors where the equipment is used and are not addressed in this chapter.

WHERE WE STAND

In 2022, emissions in the electric generation sector accounted for 18.1 million metric tons (MMT) carbon dioxide equivalent (CO₂e) out of the State’s total net emissions of 97.6 MMT CO₂e (NJDEP, 2025a).¹ Estimates of GHG emissions from New Jersey’s fossil-powered electric generating stations are based on emissions statements submitted to the New Jersey Department of Environmental Protection (NJDEP) by individual facilities.² Emissions from resource recovery facilities that use municipal solid waste as fuel for electric generation are also based on data from NJ emissions statements. Net annual imports of electricity from outside the State, when they occur, are calculated as the difference between in-state generation and in-state electricity sales, pursuant to the requirements of the Global Warming Response Act (GWRA) (P.L. 2007 c.112) (P.L. 2007 c.112; P.L. 2019 c.197). A system-wide emissions factor based on the entirety of generation in the PJM Interconnection is used to estimate emissions from these imports. Overall, the emissions reported here are the total of these three sources (fossil, waste and imported electricity).³

Historically, New Jersey’s electric sector emissions decreased from 30.9 MMT CO₂e in 2006 to 18.1 MMT CO₂e in 2022 (Table 3.1) (NJDEP, 2025a). This was due in part to the introduction of inexpensive natural gas from the Marcellus Shale formation in 2008. Low cost natural gas allowed high-efficiency combined cycle generating units to displace older coal-fired stations in the State (Figure 3.1). In addition to cost advantages, natural gas units emit less than half the CO₂ per megawatt hour (MWh) when compared to coal plants. Overlapping with this transition, New Jersey also experienced a steady increase in renewable energy, making the State a national leader in solar photovoltaic (PV) capacity. As of early 2025, total solar PV capacity in the State was more than 5.1 GW, generated by over 214,000 solar system installations (NJBPU, 2025b).

In 2022, Electric Generation was estimated to release 18.1 million metric tons of CO₂e. This represents 19% of New Jersey’s net emissions.

Table 3.1 Annual Electric Sector Greenhouse Gas Emissions 2006-2022 (MMT CO₂e), including emissions from imported electricity.

	2005	2006	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
GWP ₁₀₀	34.0	30.9	20.3	20.8	19.5	20.8	18.0	19.1	19.4	18.7	19.1	18.1
GWP ₂₀	34.1	30.9	20.3	20.8	19.6	20.8	18.0	19.2	19.4	18.8	19.1	18.1

¹ 105.7 MMT CO₂e gross emissions, minus 8.1 MMT carbon sequestration by natural resources. Electric generation was 17.1% of gross emissions and 18.5% of net emissions. These electric sector emissions were based on the 100-year global warming potential (GWP₁₀₀). Because electric-sector emissions arise from combustion, very little methane or nitrous oxide are released and emissions estimates based on the 20-year global warming potential (GWP₂₀) are nearly identical. Total economy-wide gross emissions based on GWP₂₀ were 128.8 MMT CO₂e in 2022, and net emissions were 120.7 MMT CO₂e.

² Emissions from small fossil-powered generators having capacities less than 25 MW are not captured in the Emissions Statement data. NJDEP estimates that these small sites may add roughly 0.4 MMT CO₂e above the emissions reported in the NJ Greenhouse Inventory Report, based on fuel consumption data from USEIA Form 923. (USEIA, 2023)

³ Emissions for imported electricity are estimated using the PJM System Mix emissions rate for the entire grid region, with the rate increased by 7% to account for transmission losses. Methods are discussed in Appendix B of the 2024 NJ Greenhouse Gas Inventory Report. (NJDEP, 2025a)

Figure 3.1. New Jersey's Electric Generation by Fuel Type (including imports), 2006 – 2023.

Coal-fired generation ceased in the State during 2022, offset by improved energy efficiency and a growing renewable energy portfolio. Small, behind-the-meter solar installations are not shown on this graph but added over 5 TWh that would otherwise have come from the electric grid. "Other" includes wind, hydroelectric, biomass, and minor contributors.

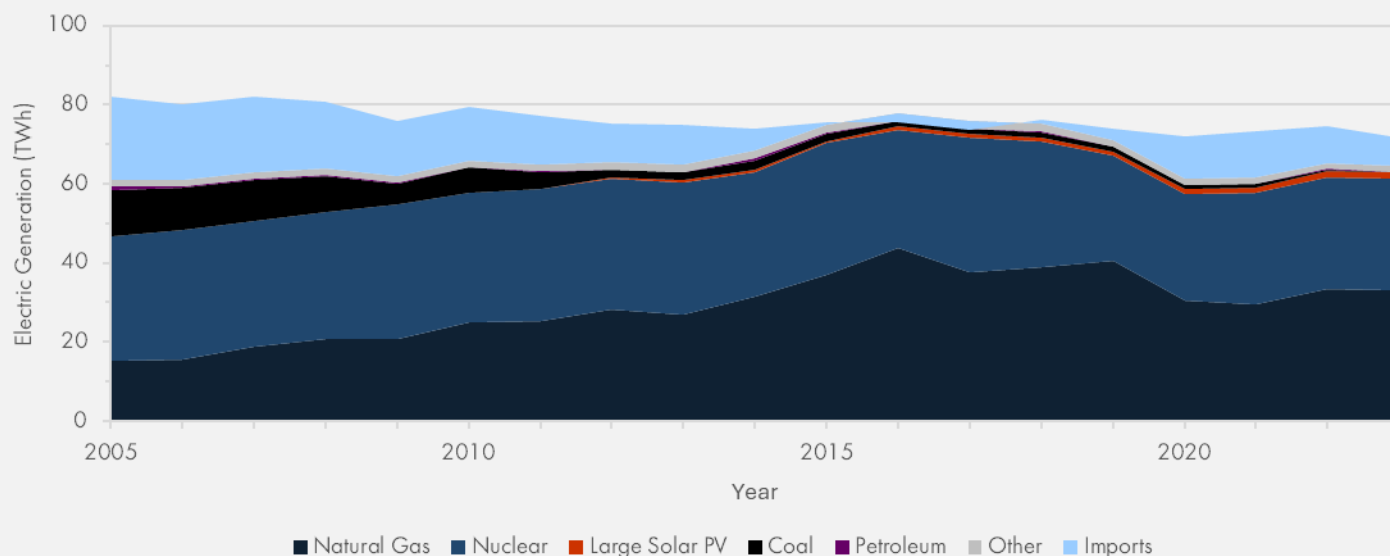
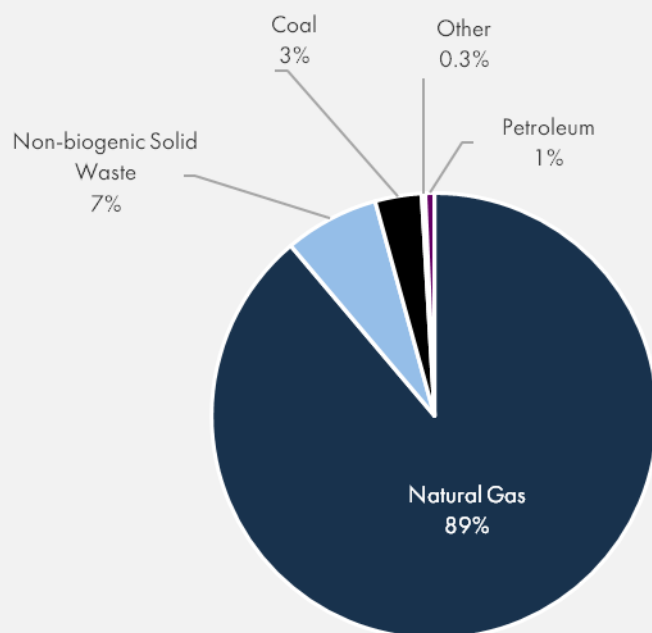


Figure 3.2. 2022 Emissions from In-State Electric Generation by Percentage.

Use of coal in New Jersey's power sector ended in the first half of 2022, leaving natural gas as the only major source of fossil energy in the sector.



In-state emissions within the electric generation sector are primarily due to the combustion of natural gas, and to a lesser extent waste materials that are of fossil origin. Other fuels, primarily liquid petroleum products, are also used in small quantities (USEIA, 2023). In 2022, natural gas combustion accounted for 89% of the 14.4 MMT CO₂e emissions from in-state generation. Waste (7%); coal (3%) and petroleum and other fuels (less than one percent) represented the remainder (Figure 3.2) (NJDEP, 2025a; USEIA, 2023).

Business-as-Usual Scenario

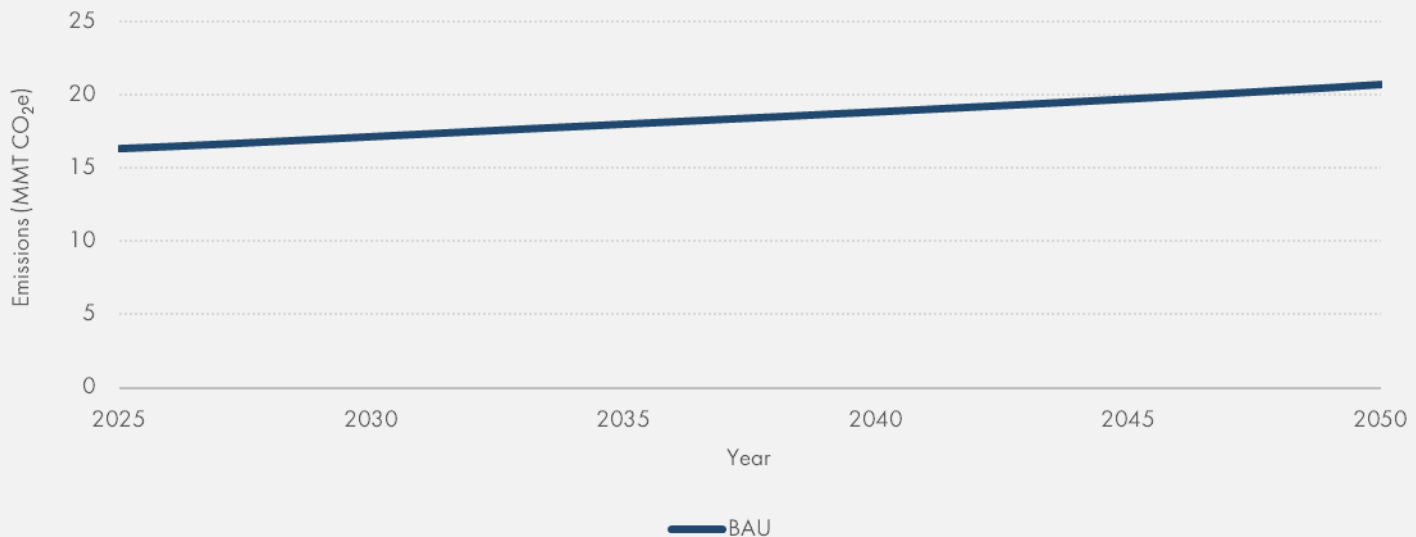
A simple reference point against which current and proposed policies can be compared is a hypothetical Business-as-Usual (BAU) case. This is modeled as a world-without-progress where population growth and its attendant economic expansion are the principal forces. As old equipment is retired, it is replaced with equipment similar to that which was available on the market at the start of the analysis, in the early 2000's. The Electricity Generation and Demand BAU scenario assumes the following circumstances:

- New Jersey's population and economy expand at their historic rates
- Electricity demand expands in proportion to economic growth
- The electricity sector's emissions rate (in kilograms (kg) CO₂e per MWh) and electricity cost (\$/MWh) remain unchanged throughout the study period⁴

Under these conditions, electric load gradually increases as GHG emissions rise proportionally. By 2050, emissions reach 20.7 MMT CO₂e, including emissions from in-state resources and imported electricity (Figure 3.3). Electric sector emissions under Business-as-usual Conditions.

Figure 3.3. Electric sector emissions under Business-as-usual Conditions.

In the absence of mitigation policies, steady growth results in an ever-increasing trend in emissions.



Current Policy Scenario

The Current Policy Scenario is based on existing policies and their anticipated continuation. For the purposes of this chapter the Current Policy Scenario projects the following outcomes based on New Jersey's existing laws and commitments as well as market-driven expansion:

- The renewable portfolio standard reaches 50% by 2030 and is not further constrained thereafter.
- Participation in the Regional Greenhouse Gas Initiative continues under the 2020 rule implementation.⁵
- 3.5 GW of offshore wind comes online by 2035 with no further additions.
- 6.5 GW of distributed solar PV is online by 2035, increasing to 7.2 GW by 2050.
- 6.6 GW of utility-scale solar PV is online by 2035, increasing to 15.4 GW by 2050.

⁴ The BAU scenario assumed existing types of generating capacity would increase in proportion to load at the same rate. For example, if demand increased by a given percent, the output from each resource type was assumed to increase by that same percent. As a result, no detailed, resource-specific modeling was conducted for this scenario.

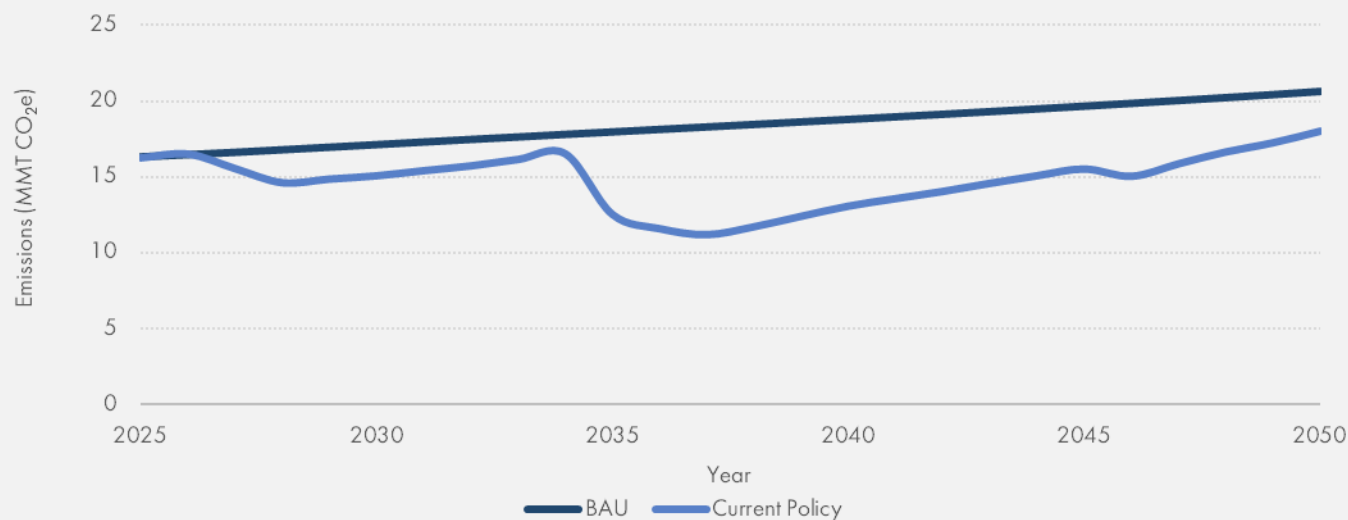
⁵ New Jersey's RGGI 2020 rulemaking calls for annual reductions of approximately 3% through 2030, after which the current rule specifies that the cap will remain flat, without further decrease.

- 2.0 GW of energy storage is online by 2030, increasing to 8.9 GW by 2050.
- The existing nuclear fleet remains online through 2050 but does not expand.
- Existing natural gas capacity is unchanged through 2050, but power output decreases 24% by 2050.

Under these conditions, electricity demand would rise more quickly than in the BAU case due to added electrification, and grid emissions rates would fall. In-State GHG emissions from the electricity sector would decline, reaching 5.4 MMT CO₂e by 2050, but imported electricity would add an additional 12.6 MMT CO₂e outside the State's jurisdiction for a total of 18.0 MMT CO₂e (Figure 3.4).

Figure 3.4. Emissions from the electricity sector under Current Policy and BAU conditions (MMT CO₂e).

While current policies reduce emissions below BAU levels, they are inadequate on their own to drive emissions downward to the 2050 goal.



CRITICAL EMISSIONS REDUCTION POLICIES ADOPTED SINCE 2020⁶

Regional Greenhouse Gas Initiative

In 2006, New Jersey and six other states in the Northeast founded the Regional Greenhouse Gas Initiative (RGGI), and in the ensuing years the number of actively participating States has grown to 10.⁷ New Jersey participates in RGGI under the legislated authority of the New Jersey Global Warming Solutions Fund Act (P.L. 2007 c.340; P.L. 2019 c.328). The collaborative RGGI program leverages a market-based cap-and-invest design to encourage development of cleaner energy resources and reduce emissions, and does so without mandating specific technologies, emissions controls, or capital investment timelines. Further, it is a regional program, which means investors in generating resources can take advantage of opportunities across participating states knowing that the same principles apply throughout. Risk is minimized because market participants can foresee future resource investment conditions years in advance by way of a planned, descending emissions cap. A robust secondary market further supports stability and flexibility by promoting trade in previously purchased allowances among market participants. In the end, owners and operators of generating resources can meet public demand for reliable and affordable energy without fear of market unpredictability. The Department of Environmental Protection and the Board of Public Utilities jointly administer New Jersey's participation in RGGI.

At the same time, RGGI promotes other climate mitigation strategies, such as energy efficiency, clean transportation, and blue (aquatic) and green (land-based) carbon sequestration, through investment of the proceeds from New Jersey's auction sale of allowances. Each participating State determines how proceeds can best be used to meet the needs of

⁶ Refer to the 80x50 GWRA report for a summary of relevant policies prior to 2020.

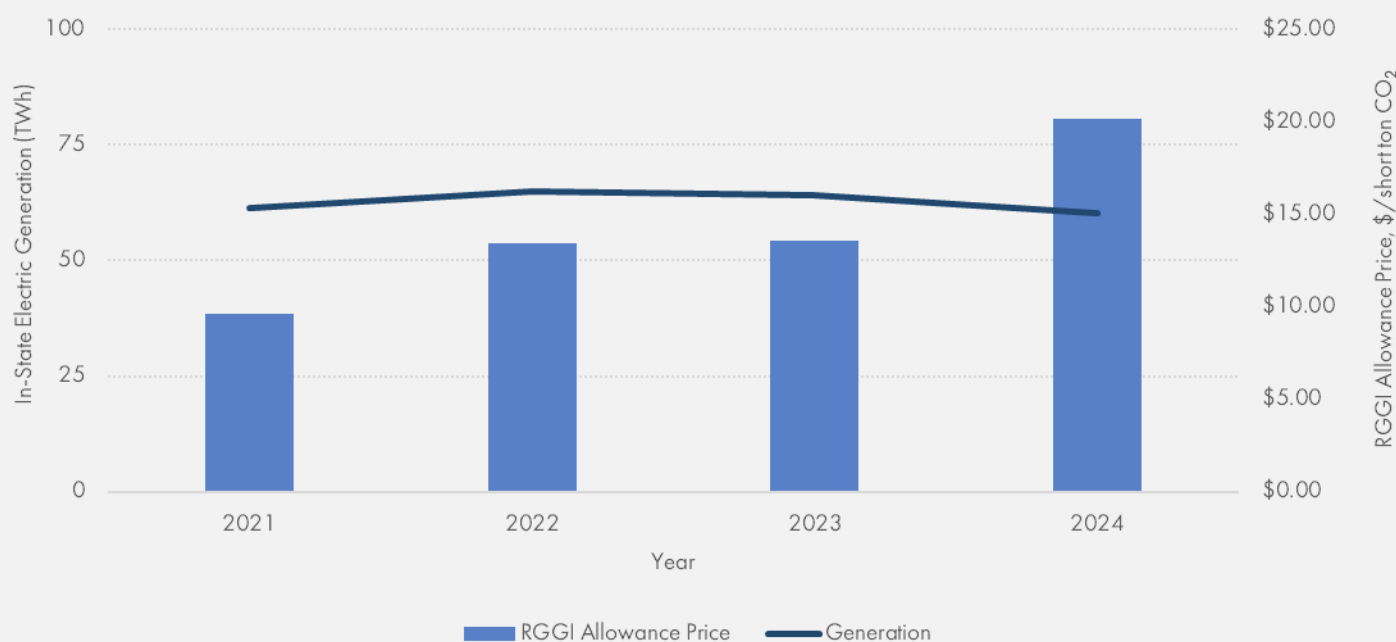
⁷ Active participants include Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, Rhode Island, Vermont and Virginia.

their constituents. In New Jersey, use of RGGI proceeds is detailed in the RGGI Strategic Funding Plan (NJDEP, 2024) based on directives in the Global Warming Solutions Fund Act.

The cost of RGGI to the consumer is low. During 2024, the average price of electricity paid by end-users in the State was 16.29 cents per kWh (\$162.90 per MWh).⁸ Of that, only 0.194 cents per kWh (\$1.94/MWh) was attributed to RGGI, or less than 1.2% of retail cost.⁹ The amount of electricity generated in the State has also remained stable since 2021 even as RGGI allowance prices increased over that time period (Figure 3.5). It is therefore unlikely that “generation shifting,” where less electricity is generated in an area subject to a carbon price in favor of resources outside the area, is occurring in New Jersey. But even if such effect were to emerge in the future, the replacement power generated outside the State would most likely come from Pennsylvania, and both New Jersey and Pennsylvania rely on similar generating resources. Specifically, they both obtain approximately 90% of their electricity from nuclear power and natural-gas fired power stations. Only five percent of electricity generated in Pennsylvania originates from coal sources (USEIA, 2025b). As a result, any shifting of generation to sources outside the State would likely rely on natural gas generators that resemble those in New Jersey, and would not necessarily lead to significantly greater overall climate emissions, a condition referred to as “emissions leakage.”

Figure 3.5. In-state electricity generation vs. RGGI allowance prices, 2021-2024.

The amount of electricity generated in the State has remained steady despite a three-fold increase in RGGI allowance prices, strong evidence that generation shifting and emissions leakage are not occurring. Ratepayers are shielded from these allowance price increases because of competition in the electricity market and the ever-increasing amount of renewable energy available.



As the interstate RGGI program continues, New Jersey and its RGGI partner states recognize that expanding the RGGI region and its associated trading market will provide additional benefits that further mitigate the risk of emissions leakage, advance regional emissions reductions in the energy sector, and bring macroeconomic advantages across the region.

Offshore Wind

New Jersey is in a favorable geographic location to take advantage of offshore wind resources, which can augment on-shore solar PV potential and other clean energy resources to meet the State’s electricity needs. The value in

⁸ US EIA Electric Power Annual 2024, Table 2.10, Average price of electricity to ultimate customers by end-use sector, by State (USEIA, 2025c).

⁹ Monitoring Analytics, PJM State of the Market Report 2024, Volume 2, Table 3-72, Components of real-time (Unadjusted) load-weighted average locational marginal pricing (LMP): 2023 and 2024 (Monitoring Analytics, 2025).

developing offshore wind is all the more clear in light of expected increases in electricity demand from the use of electrified alternatives in transportation, residential and commercial space heating, and other applications. Offshore wind will be especially important later in the energy transition as less-expensive solar opportunities on land reach full commitment and renewable options elsewhere in the region are directed to meeting the needs of their host states.

New Jersey began pursuing offshore wind development with passage of the Offshore Wind Economic Development Act (OWEDA) (P.L. 2010 c.57) in 2010. OWEDA established the Offshore Wind Energy Certificate (OREC) program and set the State's initial offshore wind goal of 1,100 MW. In the years since passage of OWEDA, a series of executive orders have confirmed the integral role offshore wind resources play in the State's long-term renewable energy strategy. The current goal, documented in Governor Murphy's Executive Order 307 signed in 2022, calls for 11,000 MW to be online by 2040 (EO-307, 2022).

Offshore wind demonstrates the importance of coordinated development across multiple sectors of the economy and highlights the time-dependency of technological advancements. Bringing offshore wind to fruition will require development of reliable supply chains, an adept workforce suited to the task, firm capital resources, and political will. While early-stage investments have been prone to uncertainties with respect to supply and cost, these experiences will facilitate widescale deployment at technological maturity. Flexible timing is essential, as is a long-term investment perspective. The recent history of offshore wind power in New Jersey also demonstrates that the State must be prepared to maintain momentum as the energy landscape evolves. When delays are encountered in the build-out of one type of renewable resource, the State must be poised to accelerate development of other renewables while challenges are met and resolved.

Solar Incentive Programs

Provisions for development of solar photovoltaic resources in the State have existed since enactment of the Electric Discount and Energy Competition Act (EDECA) in 1999, which introduced market signals such as net metering (P.L. 1999 c.23). Over the ensuing years, State policies and incentives have evolved to meet the specific needs of the State. For example, the Solar Act of 2021 revised the State's solar incentive programs and set new targets for adoption (P.L. 2021 c.169). Targeted legislation includes the Solar Ready Warehouses Law (P.L. 2021 c.290), which requires all new warehouses without completed permit approvals by July 1, 2022, to be solar ready.

Table 3.2. Key New Jersey Energy Solar Incentive Programs.

Name	Focus
Successor Solar Incentive Program (SuSI)	Established via the Solar Act of 2021 (P.L. 2021 c.169), the Solar Successor Incentive Program (SuSI) replaced the State's original Solar Renewable Energy Credit (SREC) with the SREC-II. The program provides solar incentives at lower cost to the State than the original SREC approach while promoting the orderly development of solar renewable energy throughout the State. SuSI supports new solar generation facilities connected to the transmission or distribution systems of New Jersey's electric public utilities and local government units (NJBPU, 2025c).
Administratively Determined Incentive (ADI) Program	The ADI program provides set incentives for net metered residential projects, net metered non-residential projects, and community solar projects of 5 MW direct current (dc) or less (NJBPU, 2025d). Allocations for the 2026 Energy Year (EY) ¹⁰ include support for 250 MW for residential net metered installations and 150 MW for non-residential net-metered installations (NJBPU, 2025e). The State's community solar program, discussed below, is administered through the ADI program. The ADI program, in turn, operates under the auspices of the larger SuSI program.

¹⁰ The New Jersey Energy Year (EY) begins June 1 and ends May 31, and is named for the calendar year in which the period ends.

Name	Focus
Community Solar Energy Program (CSEP)	The CSEP brings access to renewable energy to families and individuals who would otherwise find it difficult to share in the benefits of the energy transition (NJBPU, 2025f). CSEP supports community solar projects, as mandated by the Clean Energy Act of 2018 (P.L. 2018, c.17), and has been expanded by P.L. 2025 c.135, directing NJBPU to support an additional 3,000 MWs of community solar projects. Solar access for 450,000 additional residents, including 250,000 low-income families, is anticipated. As of April 1, 2025, in accordance with N.J.A.C. 14:8-9.6(l), local governments may submit registrations to NJBPU for municipal community solar automatic enrollment projects to obtain an exemption from the requirements for individual subscriber consent. This regulatory option will support the increased adoption of community solar and provide a reduced cost of electricity to residents included in the project(s). The CSEP is administered under the ADI program.
Competitive Solar Incentive (CSI) Program	The CSI program provides competitively established incentives for grid supply projects and net metered non-residential projects greater than 5 MW (dc) (NJBPU, 2025g). To date three project solicitations have occurred. The annual solicitation target is 300 MW of new solar generation, and 160 MWh of energy storage paired with solar generation. As with the ADI program, the CSI program operates under the larger SuSI umbrella.
Dual-Use Solar Energy Pilot Program	Established under the Dual-Use Solar Energy Act of 2021 (P.L. 2021 c.170), the pilot program supports development of up to 200 MW of dual-use solar projects on productive (unpreserved) farmland, also known as “agrivoltaics.” (NJBPU, 2025h).
Remote Net Metering Law	The Remote Net Metering Law allows for electricity usage from multiple government facilities to be aggregated and the total used to estimate net metered power generated by solar PV arrays at remote locations. Remote Net Metering allows for individual project sizes up to 5 MW dc and an annual total program capacity of up to 50 MWs of solar for each of the five years after the establishment of the SREC-II program in August 2021. (P.L. 2023 c.190)

Energy Storage Incentive Program

The Clean Energy Act of 2018 requires New Jersey to achieve 2,000 MW of installed energy storage by 2030. The NJBPU [launched](#) the [Garden State Energy Storage Program](#) (GSESP) on June 18, 2025, to expand transmission-scale energy storage to support the achievement of New Jersey’s energy storage goals. The multi-phase GSESP will help to address demand growth and limited supply, which are driving forces behind electricity rate increases (NJBPU, 2025i). Energy storage works to reduce supply constraints by supporting round-the-clock integration of renewable energy, strengthening the grid against outages, and potentially reducing the need for high-emitting “peaker plants” that spike air pollution. The multi-phase GSESP will include both large-scale transmission infrastructure (Phase 1) and smaller, localized energy storage solutions (Phase 2). The first solicitation under Phase 1, an initial tranche of 350-750MW towards a 1,000 MW transmission-scale procurement, was open from June 25, 2025, to August 20, 2025, with procurement decisions to be announced by NJBPU in the fourth quarter of 2025. NJBPU anticipates a second solicitation under Phase 1 to reach the full 1,000 MW goal. An additional solicitation, if required, would be announced in the first half of 2026 (NJBPU, 2025j).

Phase 2 is expected to be launched in 2026 and will provide incentives for smaller distributed energy storage projects that are connected to local distribution grids, including both “in front of the meter” (grid-connected) and “behind the meter” systems. These incentives are expected to be both fixed and performance-based. It is expected that these storage resources will prove very useful in enabling distributed energy resource (DER) aggregations.

Grid Modernization Rules

Optimal management of local distribution systems is essential if the State is to reach its distributed energy goals (Guidehouse, 2022). Towards that end, on May 21, 2025, NJBPU approved grid modernization rules that improve the local interconnection process for DERs such as solar PV and energy storage within New Jersey electric distribution

company service territories (NJBPU, 2025k; NJBPU, 2025l). An ongoing Grid Modernization Forum is facilitating expert workgroup-driven recommendations for cost effectively expanding distribution system integration capacity and opening up paths to aggregation of, and compensated participation for, these connected resources. A major goal is to dramatically increase the dynamic flexibility of local distribution system operation. Taken together, the above initiatives and underpinning legislation have laid the foundation for New Jersey's electrified future, as summarized in Table 3.3.

Table 3.3. New Jersey Energy Legislation and Policies Related to the Electric Sector.

Goal	Date	Reference
Renewable Portfolio Standard		
35% Class I	2025	Clean Energy Act (P.L. 2018, c. 17)
50% Class I	2030	Clean Energy Act
2.5% Class II	2018	Clean Energy Act
Regional Greenhouse Gas Initiative (RGGI)		
Participation in RGGI cap-and-trade program to achieve approximately 3% annual reductions in CO ₂ emissions from electric generation sector. Goals periodically updated by participating states.	Ongoing	Global Warming Solutions Fund Act (P.L. 2007 c.340); Murphy Executive Order 7; An Act Concerning the Reduction of Greenhouse Gas Emissions (P.L. 2019 c.328)
Energy Efficiency Mandates		
At least 2.15% annual reduction in electricity usage, adjusted for expanded use of electric vehicles, distributed energy resources, etc., within 5 years of implementing a utility's electric energy efficiency program.	Ongoing	Clean Energy Act; NJBPU Order (NJBPU, 2020)
Offshore Wind		
11,000 MW	2040	Murphy Executive Order 307
Solar PV		
Minimum fractions of power sales to be supplied by solar renewables attached to distribution system, decreasing from 4.8% in 2025 to 1.1% in 2033.	Through 2033	Clean Energy Act
3,750 MW new solar power generation by 2026, including - Financial incentives for at least 300 MW net-metered solar capacity per year - Competitive solicitation process for grid solar projects totaling at least 300 MW per year	2026	Solar Act of 2021 (P.L. 2021 c.169)
Community Solar Energy Program - Minimum of 150 MW Community Solar per year	Ongoing	Solar Act of 2021
Energy Storage		
2,000 MW	2030	Clean Energy Act
Grid Modernization		
Optimized interconnection process pursuant to 2019 NJ Energy Master Plan	2025	Murphy Executive Order 28 NJBPU Board Order (NJBPU, 2025l)
Adopted latest version of IEEE 1547-2018 interoperability standard pursuant to 2019 NJ Energy Master Plan	2025	Murphy Executive Order 28 NJBPU Board Order (NJBPU, 2025l)



THE PATH FORWARD

Mitigating climate emissions in the electric sector is especially challenging because of its complexity and scale. Electricity demand is expected to increase substantially over the next decades to accommodate newly-electrified systems, requiring an unprecedented expansion in generation capacity (both central and distributed) as well as introduction of significant demand flexibility. This challenge will be all the more difficult should the anticipated expansion of data centers lead to even greater load increases (Shehabi, 2024; ICF, 2025; Wiser, O'Shaughnessy, Barbose, Cappers, & Gorman, 2025). Simultaneously, older infrastructure and resources must be replaced with modern counterparts based on fundamentally different generation dispatchability and demand (load) profiles, requiring significant advances in grid operating flexibility. These efforts must occur in tandem with major transitions in the Residential, Commercial, Industry and Transportation sectors that are necessary to affordably reduce greenhouse gas emissions across the economy.

Despite these challenges, the actual tasks for the electricity sector are for the most part straightforward. Rising demand must first be offset through energy efficiency measures, and then served with expanding renewable and other clean energy and backed by energy storage. Technologies to achieve this are now readily available and will almost certainly become less expensive and more advanced over time. Upgrading regional transmission and local distribution networks will also be necessary but again will rely on existing technologies and skills, as is the case with demand management and energy efficiency improvements. But the planning and implementation of this effort will be at a large scale and will require cooperation among stakeholders in ways that may be outside their historical scope of operation. There may also be evolution of business models in conjunction with these technology changes.

The comprehensive, economy-wide modeling reflected in the CCAP Scenario establishes a pathway to achieve the decreasing grid emissions needed to meet the State's climate mitigation targets. Under this scenario, electricity demand

2050 SECTOR EMISSION GOAL

6.8 MMT CO₂e

EMISSION ACTIVITIES

- Natural Gas
- Petroleum
- Other fuel

EMISSIONS REDUCTION MEASURES

1. Revise RGGI rule to conform with 2025 Program Review model rule
2. Implement a 100% Clean Electricity Standard
3. Reduce peak demand through adoption of progressive electricity rate designs and policies to support load flexibility
4. Support continued availability of existing resources necessary for the energy transition
5. Support development of 6.2 GW solar photovoltaic capacity
6. Continue to support the development of 11 GW of offshore by 2040
7. Support the development of 2GW of new nuclear energy generation capacity by 2050.
8. Support the deployment of 13.5 GW of energy storage capacity by 2050
9. Invest in the development of 7 GW of innovative energy technology

grows more quickly than in either the BAU or Current Policy cases because of the greater conversion of fossil-fuel-consuming activities to electrified alternatives (Figure 3.6).¹¹ In fact, electricity demand is projected to more than double, from 72 TWh in 2023 to nearly 150 TWh in 2050, as the State aggressively pursues its decarbonization goals. To meet this load growth while simultaneously keeping fossil emissions in check, renewable power output must increase substantially and fossil generation must decrease (Figure 3.7, Table 3.4). This in turn will require that generating capacity increase accordingly (Figure 3.8 Table 3.5). Because renewable electricity presents intermittent supply constraints, dispatchable generating capacity is required to fill gaps when renewable output is low. The CCAP Scenario achieves this by maintaining combined cycle units but only running them infrequently. Under the CCAP Scenario, the State's reliance on imported electricity also decreases below current levels, but some outside supply is still used to meet the State's electricity demand.

Figure 3.6. Load growth under the CCAP Scenario compared with growth under Current Policy and BAU conditions (TWh).

Extensive electrification more than doubles load on the grid under the CCAP Scenario. Load growth could be even greater than shown due to unprecedented expansion of computer data centers.

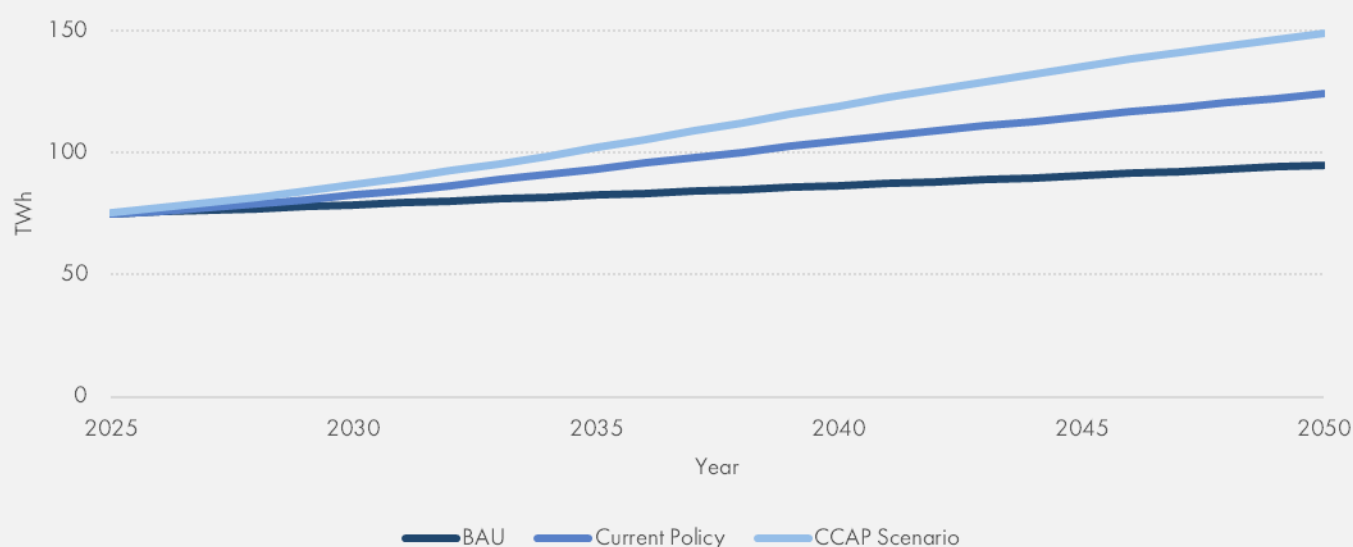
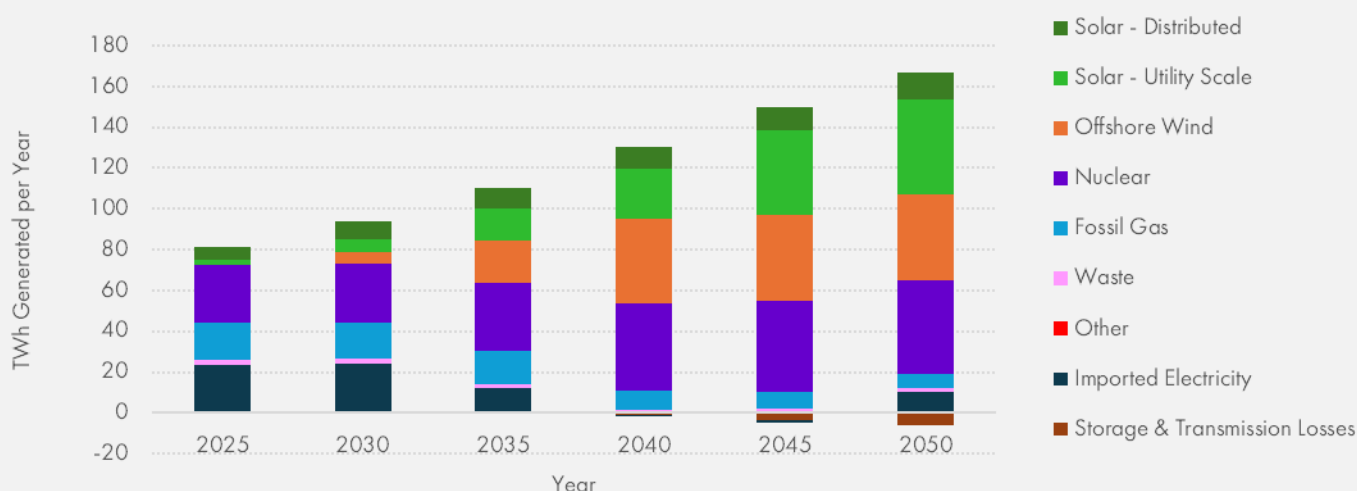


Figure 3.7. Power Generation and Storage under the CCAP Scenario (TWh per year).

In-state solar, offshore wind, and nuclear energy provide 92% of the State's electricity needs by 2050.



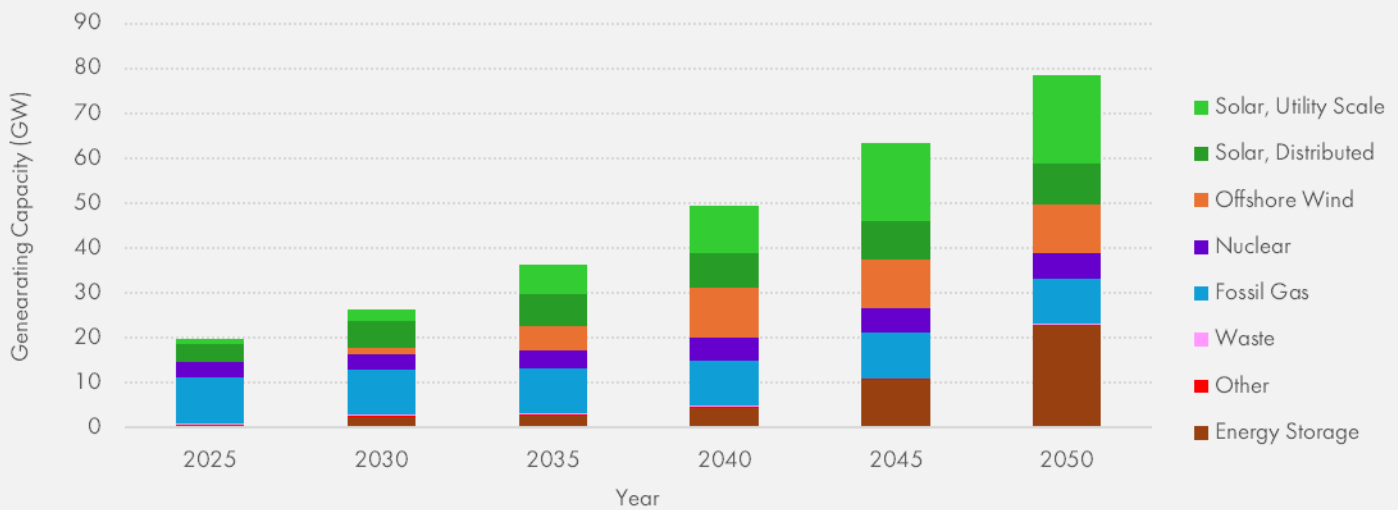
¹¹ All scenarios (BAU, Current Policy, and CCAP) also assume that load from data centers will increase from 5 TWh per year today to 11 TWh in 2050.

Table 3.4. Electricity Generation under the CCAP Policy Scenario (TWh per Year).

Resource Type	2025	2030	2035	2040	2045	2050
Solar - Utility Scale	2.6	6.2	15.6	24.2	41.4	46.4
Solar – Distributed	5.8	8.6	10.3	10.5	11.7	13.3
Offshore Wind	0.0	5.7	20.9	42.1	41.8	41.9
Nuclear	28.8	28.8	33.1	42.4	45.1	46.2
Fossil Gas	18.2	17.9	16.0	9.2	8.2	6.7
Waste	2.1	2.1	2.1	1.6	1.7	2.0
Other ¹²	0.1	0.1	0.1	0.1	0.1	0.1
Total In-State Generation	57.6	69.4	98.3	130.1	149.9	156.6
Storage and Transmission Losses	-0.2	-0.6	-0.7	-1.3	-3.4	-6.4
Imported Electricity	23.6	24.1	12.0	-0.3	-1.1	10.0
Net Power Delivered	81.0	93.0	109.6	128.4	145.4	160.3

Figure 3.8. Growth of Electric Generating and Storage Capacity under the CCAP Scenario (GW).

Solar, offshore wind and energy storage capacity expand while fossil gas resources are retained for backfill during times of low renewable energy output. Nuclear expands modestly in 2040 under this scenario.



¹² Other includes petroleum, hydrogen, hydropower, and onshore wind.

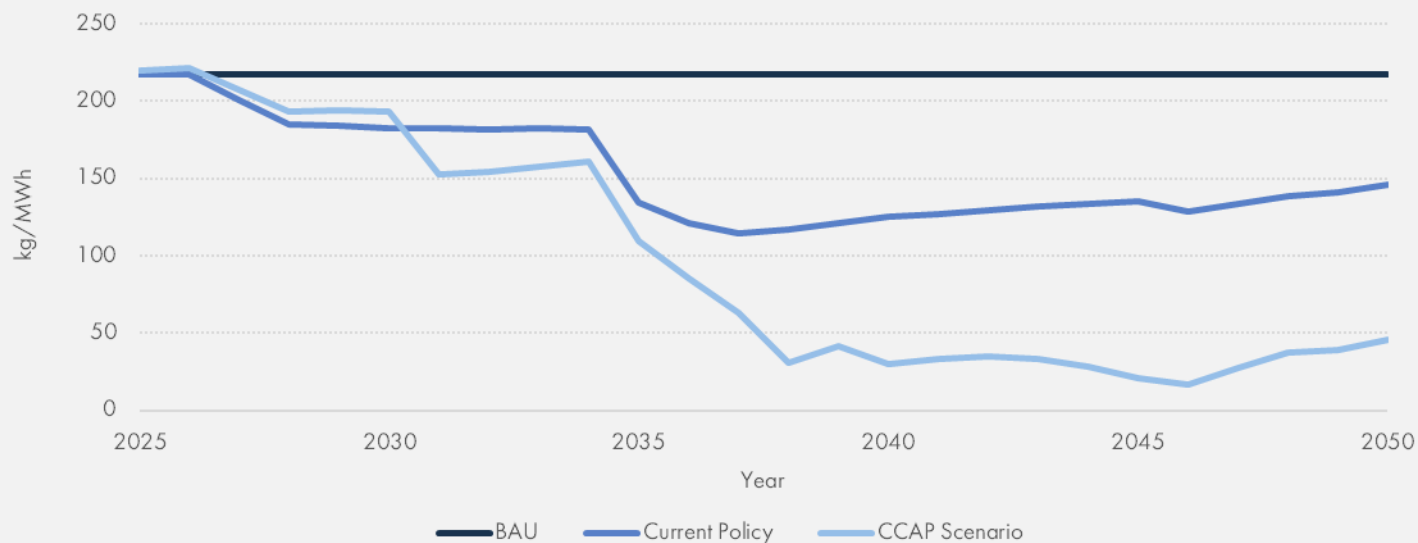
Table 3.5. Electric Generating Capacity under the CCAP Scenario (GW).

Resource Type	2025	2030	2035	2040	2045	2050
Solar, Utility Scale	1.1	2.6	6.6	10.6	17.6	19.6
Solar, Distributed	4.1	6.0	7.1	7.7	8.4	9.1
Offshore Wind	0.0	1.5	5.5	11.0	11.0	11.0
Nuclear	3.5	3.5	4.0	5.2	5.5	5.5
Fossil Gas	10.1	10.0	10.0	10.0	10.0	10.0
Waste	0.2	0.2	0.2	0.2	0.2	0.2
Other ¹³	0.1	0.1	0.1	0.1	0.1	0.1
Total In-State Generating Capacity	19.1	24.0	33.6	44.9	52.9	55.6
Energy Storage¹⁴	0.6	2.4	2.7	4.4	10.7	22.9

The net result is that grid emission rates, in kg CO₂e/MWh, decrease more quickly in the CCAP Scenario than in either the BAU or Current Policy scenarios (Figure 3.9). This in turn leads to a rapid drop in climate emissions, especially between 2030 and 2038 (Figure 3.10). Electricity-sector emissions are projected to be 16.8 MMT CO₂e by 2030; 11.2 MMT CO₂e by 2035; and 2.2 MMT CO₂e circa 2045. By 2050, emissions are projected to rise to 6.8 MMT CO₂e as the economy-wide electrification process nears completion.

Figure 3.9. Projected grid emissions rates under the CCAP, Current Policy, and BAU Scenarios (kg CO₂e/MWh).

The CCAP scenario achieves both low emissions rates and resilience by balancing resource technologies.

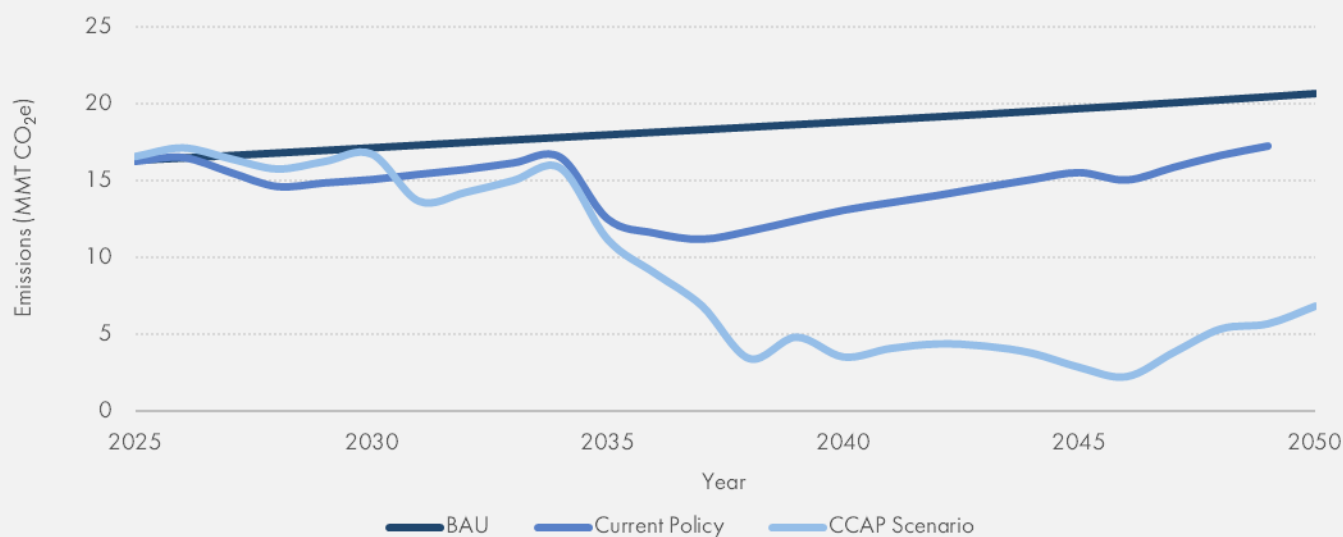


¹³ Other includes petroleum, hydrogen, hydropower, and onshore wind.

¹⁴ Energy storage includes battery and pumped hydro. Pumped hydro is 0.420 GW for all years.

Figure 3.10. Projected climate emissions from the electricity sector under the CCAP Scenario compared to emissions under Current Policy and BAU conditions.

Sustained expansion of renewable resources successfully drives emissions downward and maintains those low emissions levels through 2050.



The nine emissions reduction measures outlined below drastically curtail reliance on fossil-powered electric generation, greatly expand renewable resource capacity, and transform the electric distribution system to accommodate new power management technologies, all while meeting the State's growing need for affordable, reliable clean power. These measures will achieve the scale of emissions reductions necessary to achieve the State's targets in the electricity sector, embodied in the CCAP Scenario. The first measure is to revise the State's RGGI rule to implement the 2025 Program Review Model Rule (RGGI, 2025a). The RGGI revisions will accelerate regional emissions cap reductions through 2037, serving as a foundation on which other, resource-specific policies can be built. The second measure is also foundational: a 100% Clean Energy Standard to assure that all electricity sold in the State comes from clean electricity resources by 2035. Measures 1 and 2 both act through broad, market-based mechanisms without specifying the technologies to be used. The first applies to fossil generation in the State, the second to sources of retail electricity sold in the State regardless of origin. Together they provide a complementary framework.

Measures 3 through 9 are conducive to affordable, reliable electricity. They are within the sphere of the foundational measures discussed above and can be considered desirable outcomes of those market-based principles. Measure 3 focuses on implementing a suite of strategies that reduce peak demand for electricity, thus decreasing the amount of new energy resources the State will need as the economy electrifies. Measures 4 through 9 focus on realizing the clean energy generation capacity additions that will be needed to meet future energy demand while also achieving the State's 2050 climate emissions goals. It is expected that Measures 4 through 9 will be revisited as technologies and economic conditions evolve. Nonetheless, these parameters provide a solid footing on which to base projections of future emissions for the sector.

- **Measure 1:** Revise RGGI rule to conform with 2025 Program Review model rule
- **Measure 2:** Implement a 100% Clean Electricity Standard
- **Measure 3:** Reduce peak demand through adoption of progressive electricity rate designs and policies to support load flexibility
- **Measure 4:** Support continued availability of existing resources necessary for the energy transition
- **Measure 5:** Support development of 6.2 GW solar photovoltaic capacity
- **Measure 6:** Continue to support the development of 11GW of offshore by 2040
- **Measure 7:** Support the development of 2GW of new nuclear energy generation capacity by 2050
- **Measure 8:** Support the deployment of 13.5 GW of energy storage capacity by 2050
- **Measure 9:** Invest in the development of 7GW of innovative energy technology

Collectively, implementing the above measures will accelerate reduction of emissions from electricity generation toward the goal of 6.8 MMT CO₂e emissions by 2050.

Emissions Reduction Measure 1: Revise RGGI rule to conform with 2025 Program Review Model Rule

New Jersey will revise the State's RGGI rule, N.J.A.C. 7:27C, to incorporate the proposed changes in the 2025 RGGI Program Review (RGGI, 2025a). The rule revisions developed in the Program Review will offer fewer carbon trading allowances in future years compared to the current rule. The number of available allowances will decrease by 10.5% each year through 2033, from 69 million per year in 2027 to 17 million per year in 2033. Thereafter, the rate of descent in allowance auction sales diminishes to 3% annually until reaching 7.5 million allowances sold per year in 2037. After 2037, the model rule specifies a flat cap with no further decrease. Provisions are made for additional allowances to be released into the market at greater costs if demand exceeds supply. This phased approach takes advantage of the fact that most output from fossil generation today can be replaced by renewable energy, but that the final stretch of decarbonization will require deeper consideration of technical and operational constraints. The participating RGGI states have committed to begin planning for this last phase of decarbonization no later than 2028. (RGGI, 2025a).

Measure Quantification

As the number of allowances available for sale at auction decrease, the overall emissions of the region will fall. However, participants in the RGGI allowance market can acquire and hold allowances until a later date when the allowances can be traded or used to meet future compliance obligations. The availability of this pool creates stability and flexibility in the marketplace and provides regulated entities with additional options to meet the program's requirements. But it introduces uncertainties with respect to exactly when decreases in emissions will occur and in which State they will take place. To consider this, extensive modeling was conducted as part of the RGGI Program Review (RGGI, 2025b). To assess emissions potential emissions reductions for the CCAP, the annual percentage decreases in emissions seen in modeling were applied to the most recent emissions data for the RGGI-regulated facilities (RGGI, 2024). From this, the Department projects that emissions from facilities subject to RGGI in New Jersey will decrease from 9.8 MMT CO₂ in 2024 to 7.2 MMT CO₂ in 2030; 6.4 MMT CO₂ in 2035, and 5.3 MMT CO₂ in 2037.¹⁵ For comparison, current policies were projected to result in emissions of 7.9 MMT CO₂ in all years from 2030 onward. Emissions reduction benefits compared to current policies were therefore 0.7 MMT CO₂ in 2030; 1.5 MMT CO₂ in 2035; and 2.6 MMT CO₂ in 2050 (Figure 3.11). Cumulative benefits were 1.5 MMT CO₂ in 2030; 11.6 MMT CO₂ in 2035; and 49.9 MMT CO₂ in 2050 (Figure 3.12).

¹⁵ The RGGI program is based on CO₂ rather than CO₂e. Emissions estimates for 2024 are based on United States Environmental Protection Agency (USEPA) reporting.

Figure 3.11. Projected climate emissions reductions from Measure 1, Revision of the RGGI rule, compared to the existing rule.

The existing rule holds the number of allowances available for sale after 2030 constant, while the revised rule accelerates reductions and then holds those amounts constant after 2037.

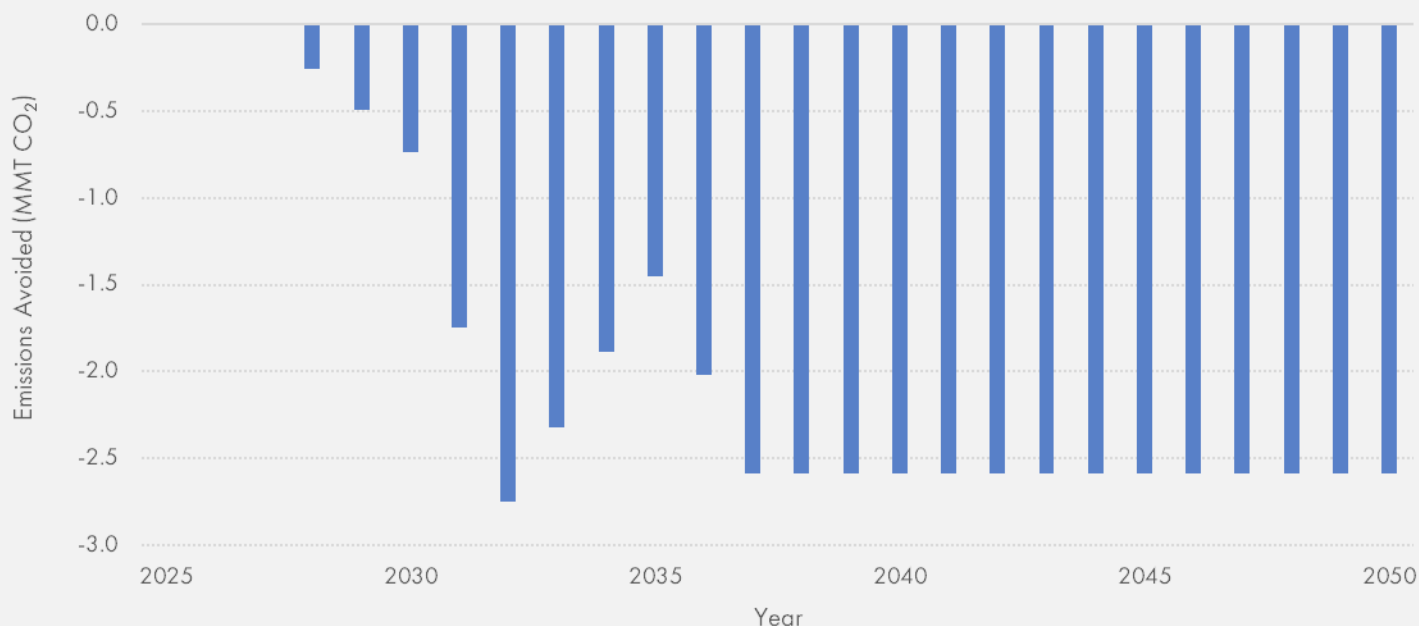
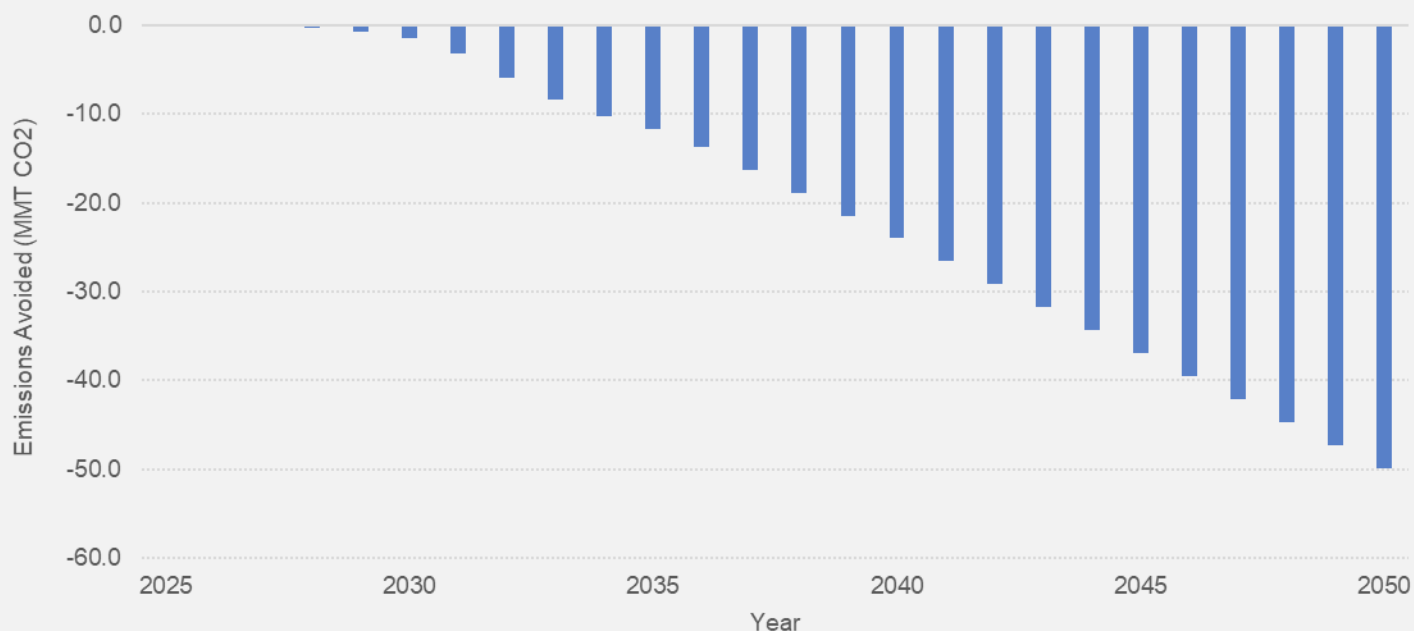


Figure 3.12. Cumulative reductions in climate pollutant emissions from Measure 1, Revision of the RGGI rule, compared to maintaining the current rule.

Sustained expansion of renewable resources successfully drives emissions downward and maintains those low emissions levels through 2050.



Priority Enabling Action

Because the RGGI program is fully established and already operates under legislated mandate, adopting the proposed rule revisions is both achievable and appropriate. Prompt implementation of this measure will allow the State to make early progress toward achieving its 2050 mandate.

Enabling Action 1.1 *Revise New Jersey's Carbon Dioxide Budget Trading System Rule*

Revise the New Jersey Carbon Dioxide Budget Trading System Rule (N.J.A.C. 7:27C) to incorporate the revisions of the 2025 RGGI program review. The NJDEP held its first stakeholder meeting to launch its RGGI rule adoption process in October of 2025. The NJDEP plans to formally propose the new rule in the spring of 2026, with rule adoption taking place by January 2027.

Table 3.6. Measure 1 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Revise N.J.A.C. 7:27C	Near Term, Complete before January 1, 2027	NJDEP

Table 3.7. Measure 1 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
No cost
Secured Funding
No additional funding is required.
Funding Gaps and Opportunities
No funding gaps for implementation have been identified.
Geographic Scope
Applies to all electric generating facilities subject to N.J.A.C. 7:27C in New Jersey.
Authority to Implement
NJDEP and NJBPU have existing authority N.J.S.A. 26:2C-45 et seq., The New Jersey Global Warming Solutions Fund Act.
Metrics for Tracking Progress
Departmental rule adoption and revision timelines will apply pursuant to the New Jersey Administrative Procedures Act, (P.L. 1968 c.410).

Emissions Reduction Measure 2: Implement a 100% Clean Electricity Standard

Mandate that 100% of retail electricity sales be provided by zero-carbon generating resources by 2035. This Clean Electricity Standard (CES) will assure certainty with respect to the origin of power sold in the State and extend the existing Renewable Portfolio Standard (RPS) to cover all of the State's supplied electric power beyond the current endpoint of 50% by 2035. This policy will complement RGGI, which applies to in-state electricity generation. For example, New Jersey imports electricity from elsewhere in the PJM grid region, and the CES will assure that the imported power is from clean sources. On the other hand, certain New Jersey generators are tied directly into the New York State electrical grid, are dispatched by NYISO rather than PJM, and serve New York load by way of dedicated transmission lines. Although the CES would not limit these resources because they do not serve load in New Jersey, the GHGs they emit

are released in New Jersey, are subject to RGGI, and the facilities will experience economic incentives to reduce or end emissions as a result of the RGGI program.

Measure Quantification

The CES constrains market behavior and results in development of additional clean energy resources. In that sense, it is not independent of the other measures described in the CCAP that add clean energy resources, and its effects cannot be easily isolated from the CCAP Scenario model results. The effects of this measure are therefore reflected in those other measure assessments.

Priority Enabling Actions

Establishing the CES will require legislation, followed by adoption of rules that formally implement the program.

Enabling Action 2.1 *Enact and Implement Clean Electricity Standard Legislation*

Enact CES legislation. Legislation (S237/A1480) introduced during the 2024-2025 session would create the “New Jersey Clean Energy Act of 2024.” The Act establishes a 100% clean electricity standard and directs NJBPU to establish a clean electricity certificate program. Following adoption of legislation, NJBPU should convene stakeholders and commence rulemaking.

Table 3.8. Measure 2 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Enact and Implement Clean Electricity Standard Legislation	Ongoing	Legislature, NJBPU

Table 3.9. Measure 2 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
No cost
Secured Funding
None required
Funding Gaps and Opportunities
No funding gaps have been identified. Implementation costs, for example web hosting services, would be addressed through user fees.
Geographic Scope
The CES would apply to all electric distribution companies (retail sellers of electricity) in the State
Authority to Implement
Subject to further legal review: Establishing a CES would require legislative action.
Metrics for Tracking Progress
Milestones to be achieved include enactment of enabling legislation, rule adoption, implementation of the rule, and achievement of compliance.

Emissions Reduction Measure 3: Reduce peak demand through adoption of electricity rate designs and policies to support load flexibility

The quantity of electric generating capacity necessary to provide reliable power is determined by the maximum peak load that the system must carry. Reducing the size of peak loads therefore translates to a smaller grid, and an ability to rely on fewer energy resources. This in turn leads to lower capital investment costs and lower costs to consumers. On the other hand, when peak loads are not well managed, the use of short-duration peak response generation results in inefficiency and high cost.

The benefits of improved energy efficiency are well known, dating back at least to the national energy crises of the 1970s (Shurr, Darmstadter, Ramsay, Perry, & Russell, 1979). But the economic and social value of improved peak-load management takes on greater significance in light of the anticipated expansion of electricity demand resulting from climate mitigation efforts. Even more, data centers may impose exceptionally high load growth, potentially reaching 6% to 12% annually, and bringing total data center load to 600 TWh nationally later this decade (Shehabi, 2024). Further, the intermittent nature of renewable resources creates economic incentives to optimize the time of day when power is used, in addition to how much is used. Incentives can also be integrated with other decarbonization efforts, for example through targeted inducements to adopt residential heat pumps and electric vehicles that open rate-management opportunities for consumers.

In fact, New Jersey has a long-established program to encourage increased energy efficiency (NJBP, 2025m) that can be leveraged to meet the challenges of tomorrow. The next step is to facilitate load management in contexts that were previously inaccessible and to do so across a broader swath of the economy, building on the State's demonstrated commitment to advanced metering technology and the innovative load-management capabilities now being built into many common appliances.

Measure Quantification

Emissions spikes during times of peak demand are currently tied directly to the use of low-efficiency, simple-cycle turbine generators that have high emissions rates. As more renewable energy and energy storage are added to the grid, the need for such simple-cycle units will decrease and emissions spikes will become infrequent, if they occur at all. In that sense, emissions reductions from replacement of simple-cycle turbines is already incorporated into other measure assessments. Modeling for the CCAP Scenario also already includes strategies for reducing peak demand, but the benefits of the peak demand policies cannot be easily separated from the benefits of other emissions reduction measures. Therefore, NJDEP has not attempted to isolate the emissions reductions benefits of peak reduction policies in isolation from the other measures. These peak demand strategies are, however, essential to obtaining the most cost-efficient benefits from the emissions reduction program.

Priority Enabling Actions

The State will implement policies and programs to reduce peak demand using electricity rate designs and load management strategies. Actions to control peak loading and promote load flexibility will be based on existing authorities and will rely on strategies that are already familiar to electric sector participants. These measures will be informed by insights and experience gained from prior actions in New Jersey and across the nation, representing the next steps in the evolution of electric sector management.

Enabling Action 3.1 Expand and accelerate adoption of time of use and time variable rate policies

The State will expand and accelerate adoption of time of use and time variable rate policies that incentivize sound energy management and avoid the excessive expense that results from high load conditions. As part of this effort, the State should determine an optimal rate policy, for example via an evaluation study or pilots. For greatest effectiveness, these efforts must include substantive public outreach that is accessible to the public and small businesses. The Residential and Commercial Chapter further describes the need to reform existing rate designs to consider heat pump rates.

Enabling Action 3.2 *Develop and implement strategies to support electric vehicle bi-directional charging and off-peak charge management*

As transportation electrification progresses in New Jersey, economic policies such as time variable rates can play a growing role in ensuring electric vehicles help balance grid load rather than contribute to additional peak demand. Newer electric vehicles and many electric vehicle charging stations come with software installed that allows users to shift charging start times from on-peak hours to periods of low electricity demand. More advanced versions of this software allow for “smart charging” which automates this process by responding to utility price signals. To support adoption of smart charging, the State may work to develop and implement electric vehicle off-peak charging strategies to promote efficient use of available resources.

Bi-directional charging takes the vehicle-grid relationship a step further by interconnecting electric vehicles to the grid where they can serve as an asset rather than a grid strain. While vehicle-to-grid (V2G) interactions are not currently allowed in New Jersey due to limited data on the impacts of bi-directional charging on grid stability, safety and operations, NJDEP, in consultation with NJBPU, is pursuing School Transportation Eco-hub (eco-hub) projects. These projects bring together battery storage, on-site renewable energy generation, and bi-directional electric school bus technologies to create a novel vehicle-grid infrastructure (VGI). The eco-hub microgrids will allow bi-directional charging to be tested in a controlled environment. The Program will deploy complete eco-hubs at several New Jersey schools with the goal of providing NJBPU and the utilities with data and analyses needed to understand and operationalize the value of bi-directional charging. This, in turn, can pave the way for regulations that motivate wider usage of these strategies. One estimate found that converting all New Jersey school buses to bi-directional capable vehicles would add over 2,179 MWh of storage to the grid (Horrox & Nick, 2022).

Enabling Action 3.3 *Support development and implementation of space heating and cooling energy management opportunities*

The State will continue to support development and implementation of water heating, space heating and space cooling energy management opportunities that minimize wasted energy, facilitate use of available control technologies, and result in ratepayer savings. For example, hot water heaters equipped with CTA-2045 adapters and similar home energy technologies can be automated to better meet user needs and reduce energy use (Bonnevillle Power Administration, 2018). Similarly, building energy management systems can coordinate energy usage at a larger scale. The State can assist individuals and organizations in making use of these energy saving opportunities.

Enabling Action 3.4 *Develop and implement support for virtual power plants*

Virtual power plants aggregate many small, localized sources of energy for coordinated grid service, allowing them to respond to peak conditions and facilitate effective demand management. The State will continue to develop and implement support for virtual power plants that can allow rapid response to changing grid conditions and provide consumer benefits without reliance on GHG-emitting resources.

Table 3.10. Measure 3 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Expand and accelerate adoption of time of use and time variable rate policies	Near Term	NJBPU, NJEDA, NJDCA
Develop and implement strategies to support electric vehicle bi-directional charging and off-peak charge management	Near Term	NJBPU, NJEDA, NJDCA, NJDEP
Support development and implementation of water heating, space heating and space cooling energy management opportunities	Near Term	NJBPU, NJEDA, NJDCA, NJDEP
Develop and implement virtual power plant policies	Near Term	NJBPU, NJEDA, NJDCA, NJDEP

Table 3.11. Measure 3 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
No cost
Secured Funding
It is not anticipated that additional funding sources will be required by the State to enable these measures. Private funding would support activities by non-State entities.
Funding Gaps and Opportunities
No funding gaps have been identified.
Geographic Scope
The entire State of New Jersey.
Authority to Implement
Subject to further legal review: Existing authorities are thought to be sufficient to implement these policies. Changes to rate tariffs may be subject to federal review and approval.
Metrics for Tracking Progress
The number of retail customers enrolling in the enhanced rate programs will be the primary metric for gauging adoption. It is anticipated that methods for assessing energy consumption and emissions impacts will be developed by the electric distribution companies as part of their rate design process.

Emissions Reduction Measure 4: Support continued availability of existing resources necessary for the energy transition

In addition to calling for a monumental expansion in the amount of renewable energy generated in the State, the CCAP scenario also makes it clear that certain resources currently online must be retained. Specifically, the State's three existing nuclear power plants are invaluable sources of clean energy, and their continued operation will greatly facilitate the achievement of the State's climate goals. However, competition with low-cost fossil resources, and in particular natural gas, make the economics of nuclear power challenging. Further, these plants must undergo licensing renewal in 2036 through 2046 and could face hurdles working through this process. The State can play a role in supporting these facilities as they navigate the challenges ahead.¹⁶

Similarly, the CCAP Scenario identifies the State's existing combined-cycle natural gas generating fleet as a necessary contributor to reliability during times of low renewable output, for example protracted periods when offshore wind output is low and solar is unavailable. Currently, these plants provide baseload service, running more or less continuously through much of the year to meet a large part of the State's demand. Transitioning to new modes of operation where these facilities play supporting roles will require economic strategies that protect ratepayers while meeting the needs of the energy transition.

The details of these efforts will need to be developed over time and with input from regulated entities and public stakeholders. The greatest benefit of this work will be to avoid unnecessary expenses such as relicensing delays and the potential need to replace large capital infrastructure.

¹⁶ Nuclear power plants are regulated by the federal government, and specifically by the US Nuclear Regulatory Commission. While the State of New Jersey can provide support and facilitate dialog, it does not have the authority to relicense the nuclear power plants.

Measure Quantification

The measure itself will avoid the potential consequences of lapses or lost infrastructure rather than lead directly to reduced emissions. Should necessary resources fail to be maintained, replacement would be costly. Timelines for achieving the State’s clean energy future could also be jeopardized as well.

Priority Enabling Actions

Enabling actions center on supporting nuclear power plant relicensing and assuring continued availability of firm, dispatchable generating resources sufficient to maintain grid reliability during prolonged loss of renewable energy output.

Enabling Action 4.1 Support nuclear power plant relicensing

The State can support relicensing of the three existing nuclear power plants by providing necessary information to the nuclear licensee and by working with the federal government to resolve issues that arise during relicensing.

Enabling Action 4.2 Support transition of combined-cycle natural gas resources to new operational role on the grid

The State will work with resource owners and operators as well as PJM to facilitate the new roles these resources will play in the energy supply. Investigative studies and stakeholder input can serve as starting points, followed by planning and then implementation. The Federal Energy Regulatory Commission (FERC) and other federal agencies will also play important roles.

Table 3.12. Measure 4 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Support nuclear power relicensing	Mid Term	NJBPU, NJDEP
Support transition of combined-cycle natural gas resources to new operational role on the grid	Mid Term	NJBPU

Table 3.13. Measure 4 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
No cost
Secured Funding
Normal operating budget.
Funding Gaps and Opportunities
No funding gaps have been identified to date. Any need for implementation funding will be determined during the development process and may require legislative action.
Geographic Scope
Statewide
Authority to Implement
Subject to further legal review:
Future legislation may be required based on the long-time horizon of these policies.

Metrics for Tracking Progress

Continued availability of the necessary generating resources.

Emissions Reduction Measure 5: Support development of an additional 6.2 GW solar photovoltaic capacity

To achieve the State's climate goals under the CCAP Scenario, it is projected that New Jersey will need 13.7 GW of installed solar photovoltaic capacity by 2035 and 28.7 GW by 2050. Modeling also projected that current policies will support 13.1 GW capacity by 2035 and 22.6 GW by 2050. This represents a gap of 0.6 GW to be filled by additional measures by 2035, and 6.2 GW by 2050. The CCAP Scenario modeling further concluded that the most cost-effective means to meet the 2035 goal was to add 0.6 GW additional distributed solar, and to meet the 2050 goal by adding another 4.3 GW of utility scale solar and 1.9 GW of distributed solar. The 2035 gap represents 4.3% of the needed installed capacity for that year, while the 2050 gap represents a 21.5% deficit. Since the gaps emerge over time in the latter part of the study period, the focus of new measures can be on the long-term expansion of solar PV. However, making these program enhancements in the near-term will allow the State to hedge its future energy options and reduce long-term uncertainties. The previously unanticipated load growth associated with data centers is a case in point demonstrating the value of responding earlier rather than later. Early action will also reduce cumulative emissions and thereby reduce climate impacts.

Measure Quantification

Emissions avoided by the planned addition of solar PV were estimated by comparison with a counterfactual in which equivalent power was generated using combined cycle natural gas (CCNG) turbines. To establish the counterfactual, it was assumed these CCNG resources would be comparable to similar resources already operating in New Jersey.¹⁷ Annual avoided emissions from the utility-scale and distributed solar PV would total 2.4 MMT CO₂e in 2030; 6.1 MMT CO₂e in 2035, and 17.8 MMT CO₂e in 2050 (Figure 3.13). Cumulative reductions would total 8.2 MMT CO₂e in 2030; 21.1 MMT CO₂e in 2035; and 223.3 MMT CO₂e in 2050 (Figure 3.14).



¹⁷ The USEPA eGrid database for 2023 was used to identify the sixteen operating CCNG units in operation in the State, with total emissions of 12.69 MMT CO₂e and generating 30,882,659 MWh of power. The average emissions rate was calculated to be 822 lbs CO₂e/MWh (USEPA, 2024). Capacity factors for solar resources were taken from the USDOE NREL 2024 Annual Technology Baseline for Class 8 conditions under the moderate projection scenario. Solar PV capacity factors varied by year. For utility scale PV the capacity factors averaged 0.25 over the study period. For distributed solar PV, all resources were assumed to be residential with an average capacity factor of 0.14. Capacity factors for distributed commercial resources were almost identical, averaging 0.15, so no attempt was made to distinguish residential from commercial resources. (NREL, 2024). Estimates were based on GWP₁₀₀, but estimates based on GWP₂₀ would be nearly identical.

Figure 3.13. Annual avoided emissions from added utility-scale and distributed solar PV capacity under current policies and under the CCAP Scenario.
Greater solar capacity in the later years under the CCAP scenario leads to greater avoided emissions compared to current policies.

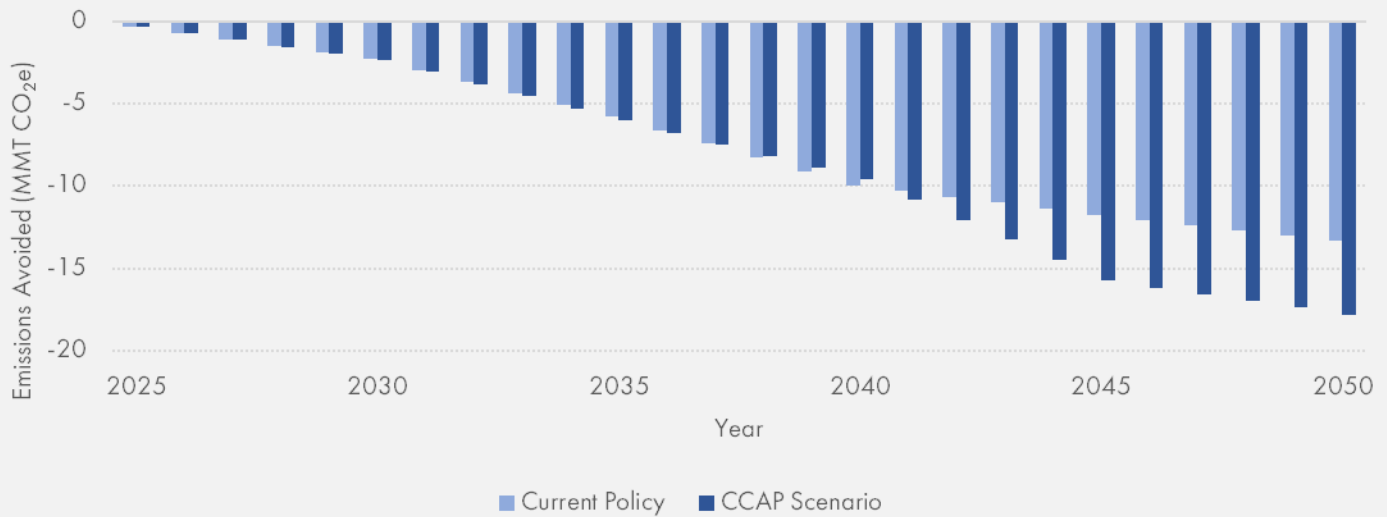
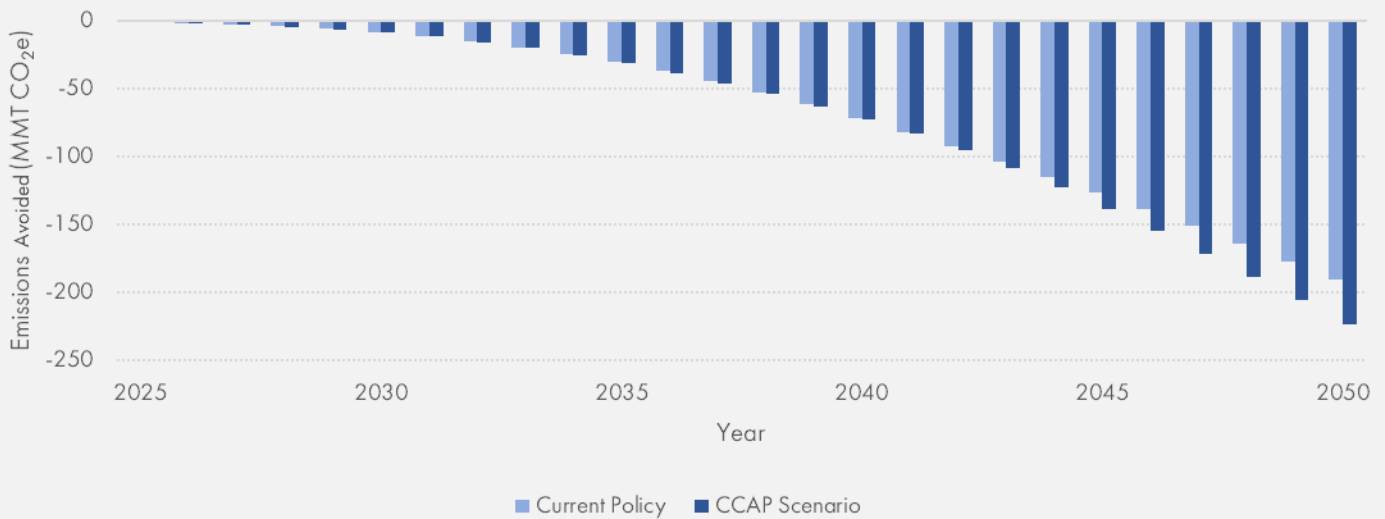


Figure 3.14. Cumulative avoided emissions from added utility-scale and distributed solar PV capacity under current policies and under the CCAP Scenario.
Over 200 MMT CO₂e is avoided by 2050 under the CCAP scenario.



Priority Enabling Actions

The strategies for achieving the goals of this measure include leveraging existing programs and policies, especially in the time frame to 2035, and implementing new programs as those first efforts run their course, especially in the years between 2040 and 2050. It is in this final run-up to 2050 that the greatest need for additional incentives is projected to occur, and it will largely be up to policy makers in that era to identify how best to proceed. But the ability to anticipate this need can prevent loss of momentum in renewable deployment.

Enabling Action 5.1 *Expand Solar PV under the Successor Solar Incentive (SuSI) Program*

The State's incentives for solar PV have been very successful, leading to the installation of 5.2 GW to date. These can be leveraged going forward to support the new, expanded solar goals of the CCAP Scenario. Between now and 2030, NJBPU will offer funding using the framework of its existing solar programs while at the same time exploring new funding opportunities to grow programs like those listed in Table 3.2. It is also expected that the current programs will evolve in the future as they have in the past. The specific details of these future enhancements will be determined through public stakeholder engagement and within the scope of legislative guidance.

Enabling Action 5.2 *Expand Solar PV under the Community Solar Energy Program*

Continuing the expansion of New Jersey's community solar program is a key strategy for ensuring a just and equitable clean energy transition. The Community Solar Energy Program (a subset of New Jersey's ADI program) allows those who rent, lack control of their roof, live in a multi-family building, do not have property suitable for solar, or cannot afford the cost of a solar installation to benefit from the cost savings and clean energy associated with solar power. New Jersey's Community Solar Energy Pilot Program was launched on February 19, 2019, pursuant to the Clean Energy Act (P.L.2018, c.17.) and was converted to a permanent program as of August 16, 2023. As of August 31, 2025, 119 community solar projects with 180 MW capacity have come online (NJBPU, 2025b).

To expand solar opportunities, including community solar, to low income and disadvantaged community households the NJBPU applied to the federal Solar for All grant program via EPA's Greenhouse Gas Reduction Fund. In April 2024, NJ was awarded \$156M in funds from EPA to deploy 175 MW of solar. The award would benefit 22,000 overburdened households within the first five years of funding and enable community solar in areas with constrained electrical grids, extend solar access to multi-family affordable housing, create pathways to residential solar ownership for low-income and disadvantaged community households, and develop the solar workforce with assistance from the Department of Labor. In July 2025, funding for the Greenhouse Gas Reduction Fund, including the Solar for All program, was rescinded by the federal government via the Working Families Tax Cut law. In October 2025, New Jersey joined 22 other plaintiffs, including labor and environmental groups, to file a lawsuit against EPA over the cancellation of the \$7B Solar for All program which would have made solar accessible to more than 900,000 low-income Americans (NJ Office of the Attorney General, 2025).

Enabling Action 5.3 *Site solar infrastructure at State and local government facilities*

Siting solar PV on government owned buildings and property will reduce energy bills and emissions. When combined with storage, it can ensure government offices and services are available during emergencies. Collectively, "public" parcels account for more than 3.6 million acres of land in the State (NJDEP, 2024). While the majority of this is characterized as forests and other natural lands that the State sets out to preserve and protect, there are still nearly 100,000 acres of rooftops and other impervious surfaces that could be suitable for sizing solar PV in an environmentally responsible manner (NJDEP, 2024). State and local governments should work toward offsetting 100% of their electricity usage with solar systems.

Work is ongoing to enable more State agencies and local governments to install solar on their facilities. For executive branch State agencies, New Jersey's Department of the Treasury developed a standardized power purchase agreement (PPA) to streamline the bidding process. New Jersey's Department of Human Services (DHS) is currently using the PPA to have a solar developer install an array at one of their facilities for electricity procurement.

On December 18, 2024, NJBPU established a Remote Net Metering (RNM) application and approval process that allows government entities to aggregate their electricity demand from multiple facilities within the same electric service territory and site a solar array, either on-site or off-site, to offset their electricity demand. Government facilities that participate in the RNM program are eligible for solar incentives via NJBPU's ADI program as the solar arrays must be 5 MW (dc) or less.

Additionally, the Alliance for Competitive Energy Services (ACES) is another program which can enable the procurement of additional solar power for New Jersey school districts. ACES procures electricity and natural gas at discounted prices for New Jersey schools, while the ACES plus program uses expert consulting support to implement advanced clean energy projects for districts (ACES, 2024).

Enabling Action 5.4 *Develop programs and policies for the years 2040 to 2050*

The State must anticipate that existing programs will require augmentation as the final decade of the energy transition approaches. The plans and policies adopted for that era must address the social and economic needs facing New Jersey at that time while achieving the State's 2050 objectives.

Table 3.14. Measure 5 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Expand Solar PV under the Successor Solar Incentive (SuSI) Program	Near Term	NJBPU, NJEDA, NJDEP
Expand Solar PV under the Community Solar Energy Program	Near Term	NJBPU, NJEDA, NJDEP
Site solar infrastructure at State and local government facilities	Near Term	NJBPU, NJEDA, NJDEP, other State, County and local government
Develop programs and policies for the years 2040 to 2050	Medium and long term	NJBPU, NJEDA, NJDEP

Table 3.15. Measure 5 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
High Note: Costs to the State for and new incentive programs will be determined by the legislature. Administrative costs will be part of existing and incurred within normal State spending. Total capital expenses are discussed in the "Capital Expenditures" that section later in this report.
Secured Funding
It is anticipated that no additional funding will be required for policy development. Existing revenue streams are available, for example from RGGI and the gas and electric utility Societal Benefits Charge (SBC).
Funding Gaps and Opportunities
No funding gaps have been identified to date. Any need for implementation funding will be determined during the development process and may require legislative action.
Geographic Scope
Statewide
Authority to Implement
Subject to further legal review: Future legislation may be required based on the long-time horizon of these policies.
Metrics for Tracking Progress
Rate of solar PV equipment installation

Power generated by the equipment
Participation rates in offered programs.

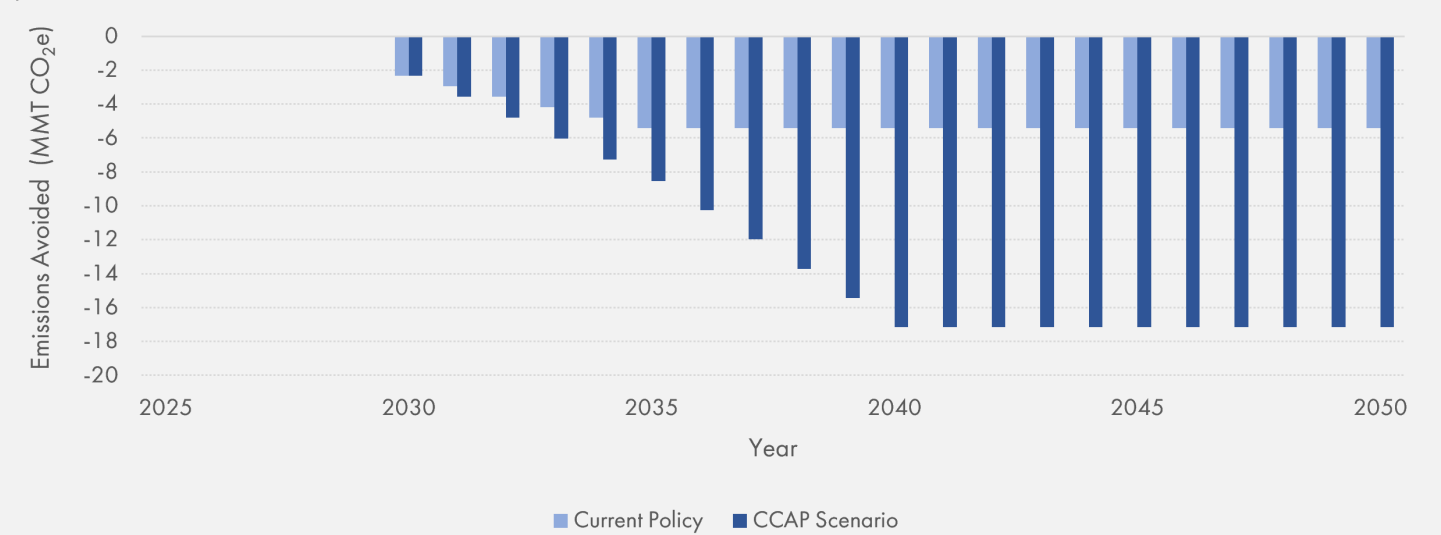
Emissions Reduction Measure 6: Continue to support the development of 11GW of offshore wind by 2040

In order to reach the State’s climate goals, New Jersey anticipates addition of 11 GW of offshore wind power generation by 2040. The CCAP Scenario modeling therefore assumed that 1.5 GW capacity would be installed by 2030, 5.5 GW by 2035, and 11.0 GW by 2040. However, New Jersey’s stated objective is to complete installation of 11.0 GW capacity by 2040, as specified by Governor Murphy’s Executive Order 307 (EO-307, 2022). Recent challenges in this sector may well delay early deployment. Federal policies have been uncertain; economic and financial hurdles have been encountered; and supply chain reliability has impeded progress. Nonetheless, New Jersey remains committed to achieving its offshore wind goals. It is also likely that these early delays will allow the technology to mature and greater competition to develop as use of wind resources expands worldwide. Ultimately, the State may benefit from what at first appears to be a setback.

Measure Quantification

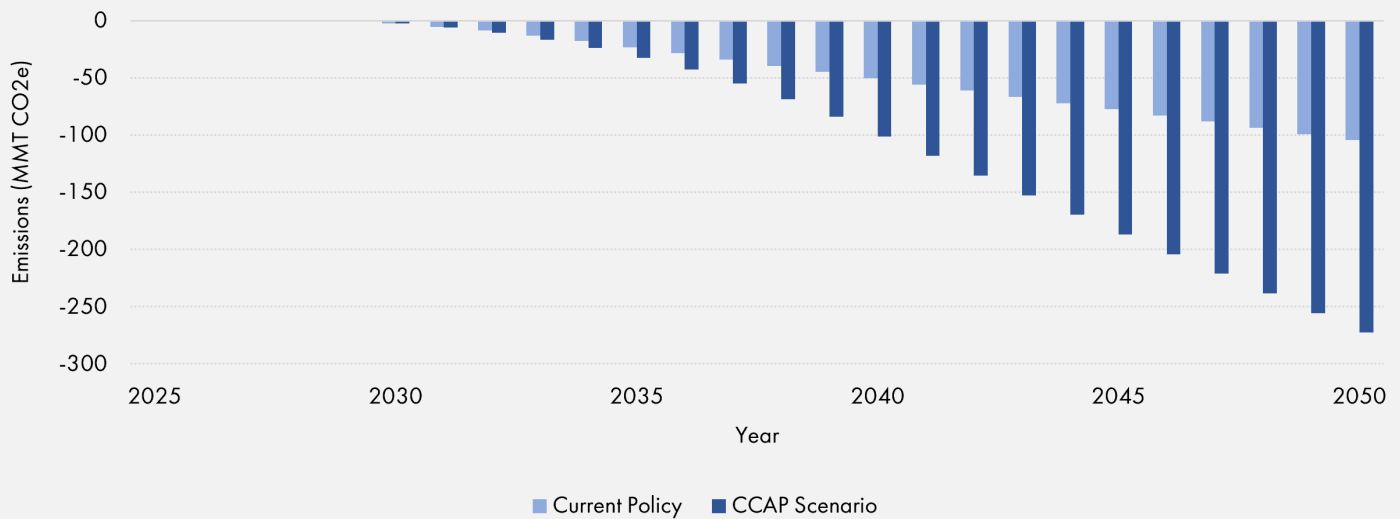
Similar to the method used to evaluate solar PV additions, a counterfactual based on equivalent power from combined cycle natural gas was used to estimate avoided emissions from the planned offshore wind resources. As with the solar analysis, to establish the counterfactual it was assumed these CCNG resources would be comparable to similar resources already operating in New Jersey.¹⁸ It was also assumed that a small amount of offshore wind would come on line as early as 2030. In that case, annual avoided emissions from the offshore wind would total 2.3 MMT CO₂e in 2030; 8.5 MMT CO₂e in 2035, and 17.2 MMT CO₂e in 2050 (Figure 3.15). Cumulative reductions would total 2.3 MMT CO₂e in 2030; 32.5 MMT CO₂e in 2035; and 272.8 MMT CO₂e in 2050 (Figure 3.16). While these estimates were based on the assumption that offshore wind capacity would begin coming online circa 2030, the date of initial deployment could be as late as 2035. The overall total deployment would remain the same regardless. The cumulative avoided emissions in 2050 under a late-deployment scenario would be dependent on the rate of deployment, with faster deployment compensating for time lost during the early years.

Figure 3.15. Annual avoided emissions from added offshore wind capacity under current policies and under the CCAP Scenario. The projection assumes offshore wind resources will start coming online by 2030, but the date of initial deployment could be as late as 2035. The total deployed capacity would remain the same.



¹⁸ The USEPA eGrid database for 2023 was used to identify the sixteen operating CCNG units in operation in the State, with total emissions of 12.69 MMT CO₂e and generating 30,882,659 MWh of power. The average emissions rate was calculated to be 822 lbs CO₂e/MWh (USEPA, 2024). The capacity factor for offshore wind was taken from the USDOE NREL 2024 Annual Technology Baseline for fixed-bottom, Class 3 resources under the moderate projection scenario. The capacity factor varied by year and had an average of 0.25 over the evaluation period (NREL, 2024). Estimates were based on GWP₁₀₀, but estimates based on GWP₂₀ would be nearly identical.

Figure 3.16. Cumulative avoided emissions from added offshore wind capacity under current policies and under the CCAP Scenario. If initial deployments are delayed to 2035, a faster deployment schedule could compensate for time lost during the early years.



Priority Enabling Actions

Deployment of offshore wind resources will follow the conceptual strategies already developed, but with timelines adapted to take advantage of evolving technologies and supply-chain improvements expected later in the energy transition process. Public input, careful planning, and a secure financial foundation will be essential.

Enabling Action 6.1 *Continue Public Engagement*

New Jersey's early experience with offshore wind has shown that misunderstanding and misinformation can sow confusion among the public and lead to wasteful delays. To counter this phenomenon, the State will continue to work with the public and affected stakeholders to make sure all parties are fully informed and that their real-world concerns are addressed within reason. This will require communicating the facts about the science, economic impacts, social and aesthetic concerns, and overall true value in completing these projects. These outreach activities will also work to dispel myths while providing members of the public with valuable sounding boards for input and participation.

Enabling Action 6.2 *Develop and implement transmission capacity for offshore wind*

To meet New Jersey's commitment to offshore wind, a power transmission network capable of carrying the generated electricity to shore must be built. To date, New Jersey has successfully engaged with the regional grid operator, PJM, to support development of these transmission resources. Referred to as the State Agreement Approach (SAA), the initiative is an outgrowth of FERC Order 1000, which requires regional grid operators to "provide for the consideration of transmission needs driven by public policy requirements in the regional transmission planning processes" (PJM, 2023). Under the SAA, NJBPU requested that PJM evaluate options for building the necessary transmission resources. In February 2023, the process moved to the next evolutionary stage when PJM filed the SAA 2.0 Study Agreement with the FERC (NJBPU, 2024). However, in August of 2025, NJBPU issued an order to delay SSA projects by 30 months. This was prompted by ongoing federal policy uncertainty. Despite these delays, when New Jersey regains momentum on offshore wind, it will be necessary to ensure the transmission infrastructure is in place. New Jersey's experience with the SSA provides a valuable foundation for future development of the necessary transmission infrastructure.

Enabling Action 6.3 *Support development of offshore wind capabilities at New Jersey port facilities*

Ports are central to offshore wind development, as they play critical roles in supporting infrastructure supply chains, staging equipment, and facilitating construction and maintenance. New Jersey has experience in developing wind port resources, and in particular a specialized offshore wind port facility located on the eastern shore of the Delaware River

in Salem County. This early experience and the resources that have been developed through it will serve as a starting point for offshore wind project development in New Jersey and potentially for other such projects up and down the U.S. East Coast. To realize the State's offshore wind goals, offshore wind port resources and the skilled workforce to operate them will be fully developed in the course of project implementation.

Enabling Action 6.4 *Support construction of 11 GW offshore wind*

The State will continue to support construction of 11 GW of offshore wind capacity. Installation is anticipated to follow the previously developed conceptual blueprint, with construction dates beginning in the late 2020s or early 2030s and then proceeding at a rapid pace to achieve full deployment by 2040. By shifting development toward the years approaching 2040, better economies of scale, newer technologies, deeper workforce development, and more robust supply chains can be summoned to bring the project to conclusion at lower cost and with potentially superior outcomes.

Table 3.16. Measure 6 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Continue public engagement	Mid Term	NJBPU, NJEDA, NJDEP, Other State, local governments
Develop and implement transmission capacity for offshore wind	Mid Term	NJBPU
Support development of offshore wind capabilities at New Jersey port facilities	Near Term	NJBPU, NJEDA, NJDEP, NJDOL&WD
Support construction of 11 GW offshore wind	Near and Mid term	NJBPU, NJEDA, NJDEP, NJDOL&WD

Table 3.17. Measure 6 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
High
Note: Costs to the State for any new incentive programs will be determined by the legislature. Administrative costs will be covered by normal State spending. Total capital expenses are discussed in the "Capital Expenditure" section in this report.
Secured Funding
As appropriate to emerging conditions, New Jersey will continue to support the development of offshore wind through the societal benefit charge and State budget allocations. New Jersey's Legislature authorized the NJBPU to offer an offshore wind renewable energy certificate (OREC) program to incentivize the build out of offshore wind in the State. Following OSW installation, the electric distribution companies (EDCs) in the State will make monthly payments to eligible offshore wind projects based on generation.
Funding Gaps and Opportunities
The long time horizon of this project will allow comprehensive financial strategies to be developed, specifically the establishment of secure and reliable sources of funding well in advance. Coupled with the potential availability of newer, more advanced wind technology at the time of construction, it should be possible to achieve better results, in less time, than originally anticipated. Overall, investors will face lower risks and ratepayers will receive better value for their energy dollar.
Additional provisions related to leasing and transmission planning may also be available to projects at the time of implementation. New Jersey will continue to pursue funding opportunities as they become available and will use them to build upon these efforts.
Geographic Scope
Statewide

Authority to Implement

Subject to further legal review:

New Jersey’s Offshore Wind Development Act (P.L. 2010 c.57) provided authority to NJBPU to establish an offshore wind renewable energy certificate (OREC), which enabled it to implement the solicitation and agreement approach described in this measure. NJBPU developed rules (N.J.A.C. 14:8-6.6 and 6.7) overseeing the OREC program.

The New Jersey Economic Development Authority (NJEDA) was formed by the Legislature, in part, to decrease unemployment in New Jersey by promoting manufacturing, industrial, and commercial jobs, as well as to undertake construction projects that would facilitate the same. (P.L. 1974 c.80). To accomplish these goals in the context of promoting New Jersey commerce and employment in the offshore wind industry, NJEDA has the authority to acquire property through purchase, lease, or otherwise necessary means (N.J.S.A. 34:1B-5(c)); enter into construction contracts for capital projects (N.J.S.A. 34:1B-5(e)); and lease its assets or property to interested parties (N.J.S.A. 34:1B-5(g)).

Metrics for Tracking Progress

The capacity (MW) of offshore wind awarded, relative to our procurement goals, and generated (annually), as monitored via ORECs, will be tracked.

Emissions Reduction Measure 7: Support the development of 2GW of new nuclear energy generation sources by 2050

In order to reach the State’s climate goals, New Jersey proposes adding at least 2GW of advanced technology clean generating capacity, potentially in the form of new nuclear power generation, before 2050. If the resource type is nuclear, it could be small modular reactors (SMRs), full scale designs such as the AP1000 pressurized water reactor, or other emerging technologies suitable to the task.

Recent nuclear projects such as construction of two AP1000 reactors at Plant Vogtle in Georgia and the cancelled construction of two AP1000 units at the Virgil C. Summer Nuclear Generating Station in South Carolina demonstrate both that new nuclear capacity can be constructed, and that development can face substantial hurdles. High cost overruns in the cited cases arose from a lack of necessary supply chain resources, shortages of craft labor during critical periods of construction, and design changes made after assembly had begun (Bade, 2017; Plautz, 2021). SMRs likewise face uncertainties, and no operating commercial units are currently online in the U.S. Further challenges include delays in establishing long-term disposal facilities for high-level nuclear waste; geopolitical challenges with respect to sources of fuel; public concerns regarding safety; and the reality that nuclear material, if not properly managed, could pose risks to national security. Time to delivery is also a potential concern given the delays encountered in completing the cited recent projects. That said, the nation’s nuclear fleet has been largely reliable, and the technology is now a central element in national and international climate mitigation plans despite having high levelized costs of energy (Lazard, 2023). Most importantly, the barriers to developing new nuclear capacity are, for the most part, surmountable, especially if there is an orchestrated national or regional program to bring economies of scale and provide sufficient resources to the endeavor (CATF, 2025). Effective planning and project management will therefore be essential to achieving success in a cost-effective and timely manner.

With respect to New Jersey, the State is home to three nuclear reactors, all located at the Artificial Island complex in Salem County. The site has adequate room for additional capacity and has already received an Early Site Permit approval from the Nuclear Regulatory Commission, valid until 2036 (USNRC, 2016). Capabilities also exist with respect to public safety and infrastructure support for the facility. The former site of the Oyster Creek facility may also be amenable to installation of new units such as SMRs.

Measure Quantification

Assuming a nuclear capacity factor of 93% (NREL, 2024), 2,000 MWs of nuclear capacity would generate 16.3 TWh annually. Using the same CCNG counterfactual as used for the solar PV and offshore wind analyses earlier, the reactor would avoid 6.1 MMT CO₂e annually once online. If the unit were to come online circa 2040, cumulative avoided emissions over the following decade would total 60.7 MMT CO₂e.

Priority Enabling Actions

Based on the experiences at Plant Vogtle and the Virgil C. Summer facility described earlier, developing full-scale nuclear capacity would have to be approached as a comprehensive process rather than simply as a construction project in order to prevent the skilled labor shortages and supply chain barriers those projects faced. With respect to small modular reactors, the details of what their deployment would require are difficult to predict since they are still in development. In any case, it is possible to outline what will be required at a general level.

Enabling Action 7.1 Engage in public outreach

Nuclear power has been contentious throughout most of its history, but public acceptance has grown over time as the accumulation of operating experience has prevented recurrences of serious accidents like the Three Mile Island incident in 1979. Developing trust and acceptance at both local and State levels will therefore be important. Towards that end, the State should develop public outreach programs early in the development process to provide accurate information on nuclear energy's economic benefits, safety, and usefulness in fighting climate change, but also to inform the public about the technology's costs, limitations and risks. Later, as possible project directions take shape, best practices in targeted public outreach will be used; for example, establishing community advisory boards and conducting regular public meetings. Potential partners in these efforts include federal agencies such as the US Department of Energy and Nuclear Regulatory Commission; utility stakeholders; and local and county governments.

Enabling Action 7.2 Develop skilled-trades workforce and nuclear energy education opportunities

The State will need to expand training programs for skilled trades relevant to nuclear energy facility construction, site operation, and supply chain development. Such trades include welders, pipefitters, electricians, and power plant specialties. As an example, New Jersey could help fund nuclear technician tracks at community colleges and work with the labor unions affiliated with the building trades to develop apprenticeship programs. It could also support nuclear energy-related educational and research efforts at the State's colleges and universities.

Enabling Action 7.3 Support design process and identification of suitable sites

The State will need to consider the prospects of new nuclear energy designs that present the best value for New Jersey. It may also consider the potential for design, engineering and manufacturing opportunities in the State with an eye toward broader economic benefits. The potential for deployment of other emerging technologies such as nuclear fusion may also be considered.

The State can also assist in identification of potentially suitable sites for new plants and opportunities for streamlining its permitting process. There are many factors to consider in siting a major energy project such as a nuclear power plant, and the State's deep resources with respect to geospatial mapping and knowledge of existing conditions and government relationships may prove invaluable in supporting private development of a nuclear reactor or other advanced energy infrastructure. The State should evaluate various use cases and environmental considerations, such as hosting nuclear at retired coal and gas plants, industrial sites that could benefit from thermal energy and impacts to water resources and the grid. Additionally, the State should consider opportunities to leverage the "energy community" designation in the Inflation Reduction Act's (IRA) 48E Investment Tax Credit program.

Enabling Action 7.4 Support development of generation capacity

The NJBPU has already begun to solicit public input on potential development of additional nuclear resources in the State (NJBPU, 2025n). This effort poses specific questions to stakeholders that will inform the Board regarding current circumstances and the challenges surrounding nuclear power, including available technologies, process safety, waste management, public engagement, economics and financing.

Examples of potential future support that could be provided by the State include tax credits, grants, low-interest loans, loan guarantees, or sponsorship of municipal bond financing for construction and supply chain development. The State's Economic Redevelopment and Growth Grant Program could serve as a model in this effort. The State can also work with its partners to ensure predictable cost recovery for new facilities, as currently no State subsidy exists for new nuclear. The State can consider adopting new subsidy mechanisms, similar to the programs for solar PV, offshore wind and battery storage. The State may benefit from a wholesale review of subsidy mechanisms, based on a cost benefit assessment which factors in economic, land use and environmental impacts.

The State can assist in leveraging federal support, such as through the US Department of Energy's Loan Program Office and its Advanced Reactor Demonstration Program.

The State may consider partnering with other states to achieve economies of scale and avoid duplication of effort during development (CATF, 2025).

Table 3.18. Measure 7 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Engage in public outreach	Near Term	NJBPU
Develop skilled-trades workforce and nuclear energy education opportunities	Near and Mid Term	NJDOL&WD, NJDOE, NJDCA, NJEDA, NJBPU, State Colleges and Universities
Support design process and identification of suitable sites	Near and Mid Term	NJBPU, NJDEP, NJEDA
Facilitate siting and permitting	Mid Term	NJDEP, NJBPU, NJDCA
Support development of generation capacity	Mid Term	NJBPU, NJEDA, NJDEP

Table 3.19. Measure 7 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
High
Note: State contributions toward new incentives and education programs will be determined by the legislature. Administrative costs will be covered by existing State spending. Total capital expenses are discussed in the "Capital Expenditure" section later in this report.
Secured Funding
Initial planning is not anticipated to require additional funding.
Funding Gaps and Opportunities
Implementation and procurement will likely rely on funding from both State and federal sources, as available at the time of implementation. Current existing opportunities include the Department of Energy's Loan Program Office, Advanced Reactor Demonstration Program, and IRA tax credits, specifically, the 48E Investment Tax Credit.
Geographic Scope
Specific candidate sites are to be identified during the planning process
Authority to Implement

Subject to further legal review:

Regulatory authority over nuclear power is complex, with responsibilities divided among the US Nuclear Regulatory Commission, US Federal Emergency Management Agency, US EPA, US Department of Energy, and the State of New Jersey. New Jersey has established regulatory authorities with respect to nuclear emergency response capabilities required under federal regulations as part of plant licensing. These authorities would also apply to any new reactors.

Metrics for Tracking Progress

Key planning and implementation milestones would be evidenced by publication of planning documents, completion of stakeholder engagement activities, completion of solicitation and procurement proceedings, advancement through stages of construction, and ultimately receiving site operating licenses from the federal government.

Emissions Reduction Measure 8: Support deployment of an additional 13.5 GW of energy storage capacity and comprehensive grid improvements

Many renewable energy resources provide variable power output, for example as wind speeds change and as the sun rises and sets. Loading also varies throughout the day in accordance with the daily cycle of life. Today, these fluctuations are managed mostly with natural gas turbines that quickly speed up and slow down to keep supply paired with demand. However, energy storage systems, and in particular batteries, can provide these same services without using fossil fuels, and at nearly instantaneous speeds. Therefore, as more and more renewable generating resources come online, the need for energy storage to smooth the valleys and peaks will grow accordingly. Energy storage can also allow an excess of wind or solar power at one time of day to be used at a later time when those renewable resources are less productive, and this too will become more valuable as renewable generation expands.

Under the CCAP scenario, expansion of energy storage is projected to play out most notably in the latter part of the energy transition. In 2035, the State will only need 2.3 GW of installed energy storage capacity, but this will grow to 22.4 GW by 2050. Modeling also projects that current policies will support 2.0 GW capacity by 2035 and 8.9 GW by 2050. There is therefore a gap of 0.3 GW to be filled by additional measures by 2035, and 13.5 GW by 2050. The 2035 gap represents 12.3% of the needed installed capacity for that year, while the 2050 gap represents a 60.2% deficit. Since the gaps emerge over time mostly in the latter part of the study period, these modeling results imply that this CCAP measure should focus more on long-term expansion. However, the rapid rate of advancement make it implausible to describe enabling actions today for conditions that will be encountered in the later years of the energy transition. The strategies that will be used to address this challenge are therefore left to be defined as that time frame approaches.

A related consideration is that efficient utilization of renewable energy depends on pairing energy storage with renewable generation at appropriate scale. As a result, storage needs may vary from modeled projections based on conditions encountered during real-time implementation; for example if economics support more rapid deployment of solar PV during earlier years.

Just as energy storage is essential to efficient utilization of renewable power, a modernized grid infrastructure is also central to achieving the State's clean energy goals. The need for modernization and adaptation extends to both transmission networks and local distribution systems. Reconductoring and improved thermal management of transmission lines are examples of technologies that can allow more efficient power transfer across long distances, while local improvements can boost hosting capacity and enable better integration of distributed energy resources. Some of these actions, like reconductoring of long-distance lines, will be managed largely through the private sector with existing State support. The actions described below therefore focus on distribution-level improvements.

Measure Quantification

The impact of energy storage on emissions is a function of the displaced fossil generation that would otherwise be necessary, as well as the energy lost during the storage process. The CCAP Scenario modeled the benefits of energy

storage as an integral component of the broader renewable energy buildout, and these benefits were not quantified as independent values. However, using energy storage in conjunction with clean generating resources will result in substantially better utilization of the generated power, thereby reducing use of fossil generation that would otherwise be necessary.

Priority Enabling Actions

As noted earlier, existing programs that support energy storage provide a starting point for meeting the State's mid-term target of 2.3 GW of energy storage by 2035. Enhancement of those programs, for example by facilitating interconnection of energy storage systems to the grid and using storage resources such as vehicle batteries to support non-mobile applications, can help fill that short-term gap. With respect to the State's long-term needs, much will depend on the evolution of storage technologies and their respective costs. Because this area is rapidly evolving, it would be difficult to accurately project what will be available a decade from now. However, a starting point is to recognize that many of the existing strategies such as subsidization will still be available. Market forces driven by programs such as RGGI and the CES will also encourage project investors to pursue the most cost-effective solutions available at that time. The State can further facilitate the evolution of energy storage technology by supporting basic research and development as well as ensuring a strong business environment as described later in Measure 9.

Enabling Action 8.1 Improve hosting capacity of New Jersey electric distribution system through grid modernization

New Jersey's clean energy future can only be realized by improving the hosting capacity of its distribution grid such that the grid can accommodate greater amounts of distributed energy resources (such as solar PV) while maintaining reliable system operations. In 2022, NJBPU issued a Grid Modernization Study (Guidehouse, 2022) which recommended nine actions. Recent rulemaking began the process of adopting these recommendations (NJBPU, 2025k), and NJBPU is launching a series of working groups to review the five most complex recommendations. The initial focus of these working groups will be to collaboratively define the requirements for proactive DER Integration Roadmaps. Utilities will prepare and file these plans with NJBPU to establish their strategies and priorities for accelerating DER adoption.

Enabling Action 8.2 Support implementation of FERC Order 2222 for distributed energy resources

FERC Order 2222 allows small, distributed energy resources to participate in the wholesale energy markets. In the past, resources such as home energy storage systems, solar panels, and electric vehicles would be too small to participate at the wholesale level, but Order 2222 allows large numbers of these resources to be aggregated into groups large enough to enter the market. NJBPU is evaluating State policies with respect to implementing FERC Order 2222 (NJBPU, 2025o), and PJM is working to accommodate these aggregations without impacting system reliability. The State can support these efforts, both in the current exploratory stage and during large scale expansion, to provide value to ratepayers while advancing the State's clean energy objectives.

Enabling Action 8.3 Evaluate, and where appropriate, deploy grid supportive technologies such as Vehicle-to-Everything "V2X" and microgrid systems

Energy storage exists in an increasing number of applications, for example in electric vehicles and home energy storage systems. New Jersey is seeking new ways to make use of these resources while simultaneously providing value to ratepayers. For example, Vehicle-to-Everything "V2X" seeks to use the power stored in electric vehicle batteries for a variety of applications by establishing a bidirectional (two way) connection between the vehicle and other energy infrastructure. Alternatively, Vehicle-to-Building (V2B) can provide energy backup to a residence in addition to charging the EV, Vehicle-to-Grid can allow EV batteries to modulate fluctuations in the local distribution network by charging and discharging in small increments, and Vehicle-to-Storage (V2S) can combine the EV battery with in-home storage for extended off-grid service. In particular, V2S coupled with microgrids¹⁹ or nano-grids can provide resilient power during times of emergency and alleviate peak load, avoiding peak energy costs and reducing CO₂ emissions. Under the new eco-hub pilots, NJDEP and NJBPU are working to deploy vehicle-to-building pilots at up to four New Jersey schools with the goal of providing NJBPU with the data and analyses needed to understand and operationalize the value of bi-directional charging, potentially paving the way for regulations that motivate wider usage of these strategies. These

¹⁹ A microgrid is a cluster of critical facilities and DERs that can connect and disconnect from the local distribution grid.

pilots will demonstrate whether bi-directional charging could both reduce grid strain during peak hours and support grid reliability, and at the same time minimize price spikes to the customer to save ratepayers money.

State and local entities should continue to seek to pilot grid supportive technologies in order to ensure resilient power during times of emergency. However, full scale adoption of these technologies will benefit from further development of connection standards.

In tandem, NJBPU has joined a U.S. Department of Energy-led cohort in a “V2X Collaboration Memorandum of Understanding” (USDOE, 2022). This agreement will provide access to leading technical and business expertise aligned with standardizing and commercializing this latent capability.

Microgrids also support decarbonization efforts when they rely on locally generated clean power rather than the grid. Presently, the NJBPU is supporting microgrids via a Town Center Distributed Energy Resources Incentive Program. Seven projects within the program are undergoing engineering design.

Enabling Action 8.4 *Implement and enhance storage component of Competitive Solar Incentive program*

Adding energy storage to solar installations offers several benefits including energy shifting, increased local consumption, increased grid independence, peak shaving, demand charge reduction, and if done properly, environmental benefits due to reduced greenhouse gas emissions. NJBPU will continue to support the buildout of energy storage in conjunction with large grid supply solar projects under the Competitive Solar Incentive (CSI) program. The State will consider additional opportunities to pair clean energy resources with energy storage.

Enabling Action 8.5 *Support Resilient Local Governments*

Ensuring the availability of critical government services during times of emergency is essential. The deployment of renewable energy and storage systems in local government buildings can therefore promote operational continuity during grid disruptions. Such systems also have the potential to reduce energy costs by reducing reliance on purchased energy. State-supported financial incentives for solar and storage can be facilitated by “direct pay” options where local governments become eligible for substantial credits for such projects. New Jersey’s existing Community Energy Plan Implementation Program could disburse funding.

Table 3.20. Measure 8 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Improve hosting capacity of New Jersey electric distribution system through grid modernization	Ongoing	NJBPU
Support implementation of FERC 2222 for distributed energy resources	Ongoing	NJBPU
Evaluate and, where appropriate, deploy grid supportive technologies such as Vehicle-to-Everything “V2X” and microgrid systems	Ongoing	NJBPU, NJDEP
Implement storage component of Competitive Solar Incentive program	Ongoing	NJBPU
Support Resilient Local Governments	Near term	NJBPU, NJEDA, NJDCA

Table 3.21. Measure 8 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
High

Note: Costs to the State for any new incentive programs will be determined by the legislature. Administrative costs will be covered by normal State spending. Total capital expenses are discussed in the “Capital Expenditure” section later in this report.

Secured Funding

Funding through 2030 has already been allocated under the Garden State Energy Storage Program

Funding Gaps and Opportunities

Funding beyond 2030 must be secured.

Geographic Scope

Statewide

Authority to Implement

Subject to further legal review:

Existing authority under the Clean Energy Act (P.L. 2018, c.17) through 2030

Additional authority needed for subsequent years.

Metrics for Tracking Progress

Quantities of energy storage resources added to the grid

Quantities of energy storage resources procured with program support

Emissions Reduction Measure 9: Invest in the development of 7 GW of innovative energy technology

During public engagement, participants clearly expressed their desire to see the State eliminate greenhouse gas emissions from the electricity sector. However, substantial uncertainties exist in any attempt to project conditions decades into the future. It is therefore worthwhile to consider contingencies for the later years of the energy transition.

As the State approaches the 2040s, future technologies will likely become available that will allow the State to eliminate additional emissions while improving reliability. Pursuing such opportunities could also lower consumer costs and support New Jersey’s economy by reducing reliance on long-distance transmission of power produced far away. Further, other States will benefit from the availability of clean energy resources within their jurisdictions that would otherwise serve New Jersey load. And it must be acknowledged that the State’s existing nuclear reactors will face retirement at some point, and it would be judicious to plan for their eventual replacement before that day comes.

Examples of potential candidate technologies may include long duration energy storage; advanced nuclear including fusion; green hydrogen; biofuels; carbon capture and storage; ocean-based energy; and demand management strategies that are beyond current conception. Since timeframes for developing and adopting new technologies can be measured in decades, and learning curves often present additional constraints, it is important for the State to begin planning and development years in advance, long before any anticipated project completion date.

Investing in education, research and development is essential to maintaining New Jersey’s position as a leader in energy technology. Beyond 2050, the State must expect to pursue climate mitigation outside the timeframe that planners of today can foresee. Future generations will appreciate the planning and investments we make today that will help them to continue to build upon the clean energy transition.

The goal of Measure 9 is therefore to set the stage for full decarbonization of the electric grid and eventual elimination of the emissions remaining in 2050, as well as providing a contingency to address unforeseen changes. The proposed

7 GW additional capacity may be insufficient to fully eliminate the residual fossil emissions in 2050 but will aid in reaching the ultimate endpoint of a completely decarbonized electricity sector in the following decades. Since this is an end-stage measure, no emissions reductions are anticipated prior to the mid- to late 2040s.

Measure Quantification

Emissions reductions from the proposed capacity addition will depend on the specific types of technology installed. Quantification of benefits will therefore be integral to evaluating different design alternatives as the implementation timeframe approaches. However, as an example of emissions that can potentially be avoided, a 7,000 MW nuclear reactor with a capacity factor of 93% (NREL, 2024) could avoid 21.3 MMT CO₂e annually when compared with CCNG resources emitting at a rate comparable to existing CCNG operating in New Jersey. If deployed in 2045, cumulative avoided emissions over the following five years would total 106.3 MMT CO₂e.²⁰ It should be noted that nuclear power is only presented here as an example and should not be taken as a recommendation for how this measure should be fulfilled. Also, the actual emissions avoided will depend on the characteristics of the resources constructed, the amount of fossil emissions remaining online in the State at that time, and the sources of any electricity being imported from the regional grid.

Priority Enabling Actions

The proposed actions will promote long-term capability development. Building from this foundation, the State must expand economic opportunities and support innovative solutions to the climate challenge. The culmination of this process will be the opening chapter of the State's energy future beyond 2050.

Enabling Action 9.1 Support energy and climate education

The State will support basic research and whole-of-life education related to energy and climate systems, which is necessary for innovation and advanced climate mitigation. This includes:

- Preschool programs and learning activities that engage young children's curiosity and sense of social responsibility.
- Primary and secondary school science, technology, engineering and mathematics (STEM) education that prepares students for fulfilling lives and prosperous careers in support the State's climate change mitigation and clean energy production goals.
- Higher education in energy- and climate-related disciplines, leading to new discoveries and concepts.
- Trade and professional skills development to accelerate adoption of new energy technologies that will reduce and reverse climate impacts.

Enabling Action 9.2 Support development of new energy-related businesses related to climate mitigation and resilience

The State will support continuous technological development and adoption of new energy-related resources at the pilot, early market, and mature market phases, which is necessary if the State is to realize its energy and climate objectives.

Enabling Action 9.3. Apply promising new technologies to bring 7 GW of clean, firm, dispatchable power online by 2050

The State will need to support development of an additional 7 GW of clean, firm, dispatchable power. The State should consider evaluating the various candidate resources, assessing performance attributes, emissions, costs and other considerations for viability and timing for potential adoption in New Jersey. This evaluation could take the form of a technoeconomic assessment report to inform project development.

²⁰ The emissions rate for the State's existing CCNG resources was discussed earlier in the sections on solar PV and offshore wind measures.

Table 3.22. Measure 9 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Support energy and climate education	Ongoing	NJDOL&WD, NJDOE, State Colleges and Universities
Support development of new energy-related businesses related to climate mitigation and resilience	Ongoing	NJEDA, NJBPU
Apply promising new technologies to bring 7 GW of clean, firm, dispatchable power online by 2050	Long Term	NJBPU

Table 3.23. Measure 9 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
Unknown – capital expense will be dependent on technology chosen.
Note: Costs to the State for new programs and activities will be determined by the legislature. Administrative costs will be part of existing State spending.
Secured Funding
Existing funding for education, research, and development of innovative technologies.
Early-phase business funding from seed development resources, for example programs supported by the NJ Economic Development Authority
Private capital is expected to be the primary source of funding for construction of new generating resources.
The legislature must review the State’s laws and make appropriate changes as opportunities emerge.
Funding Gaps and Opportunities
The State must be prepared to expand resource availability as new opportunities arise.
Geographic Scope
Statewide
Authority to Implement
Subject to further legal review:
Enabling actions are authorized under existing legislation and rules for support of innovative technologies and education.
The New Jersey Commission on Science, Innovation and Technology operates under legislated mandate to encourage collaboration and connectivity between industry and academia, and to translate innovations into successful high-growth businesses (P.L. 2018 c.91; NJCSIT, 2025).
In 2020, New Jersey became the first state in the nation to incorporate K-12 climate change education across content areas (NJ Department of Education, 2020; NJ Climate Education Initiative, 2025; NJDEP, 2025b).
Future legislation could be required based on the nature of the forthcoming technologies.
Metrics for Tracking Progress
Educational metrics such as the National Assessment of Education Progress; number and quality of patents granted; demographic profiles of employment in the State; business creation rate in applicable fields; applicable product offerings. Deployment of future generating capacity will be the principal metric for ultimate assessment of the Measure’s success.

CAPITAL EXPENDITURES

Anticipated capital expenditures, over and above those projected under current policies, total between \$52 billion and \$98 billion dollars over 25 years, requiring an additional annual capital expenditure of \$2.1 billion to \$3.1 billion on average each year (Table 3.24). These estimates include both private and public investments. Because these are profit-making investments that will be owned by private enterprise, the degree to which government support will be necessary, and in what form it will be provided, must be decided by the legislative and executive branches.²¹

Table 3.24. Average annual capital expenditures by resource type (millions of dollars per year) and 25-year total capital investment (millions of dollars).²²

Estimates are for capital investment over and above expenditures already committed to in the Current Policy Scenario. Estimates apply to each year in the five-year period ending with the indicated year. These estimates are based on total investment, and it is expected that private capital will be the primary source for these funds. Potential contributions from State sources will be determined by the State legislature as projects evolve. Values in the table have been rounded so adding columns or rows may not result in exactly the same total as shown in the table.

Low Cost Estimate (NREL Advanced Scenario)

Resource Type	Year					25-year Total by Resource (Rounded)
	2030	2035	2040	2045	2050	
Nuclear	0	500	950	140	0	8,000
Offshore Wind	0	1,170	3,060	0	0	21,000
Utility-Scale Solar	0	0	-130	610	30	2,500
Distributed Solar	80	90	90	90	90	2,000
Battery Storage	0	100	-300	1,170	2,630	18,000
Total by Year (Rounded)	80	1,900	3,700	2,000	2,800	52,000

Mid-Range Cost Estimate (NREL Moderate Scenario)

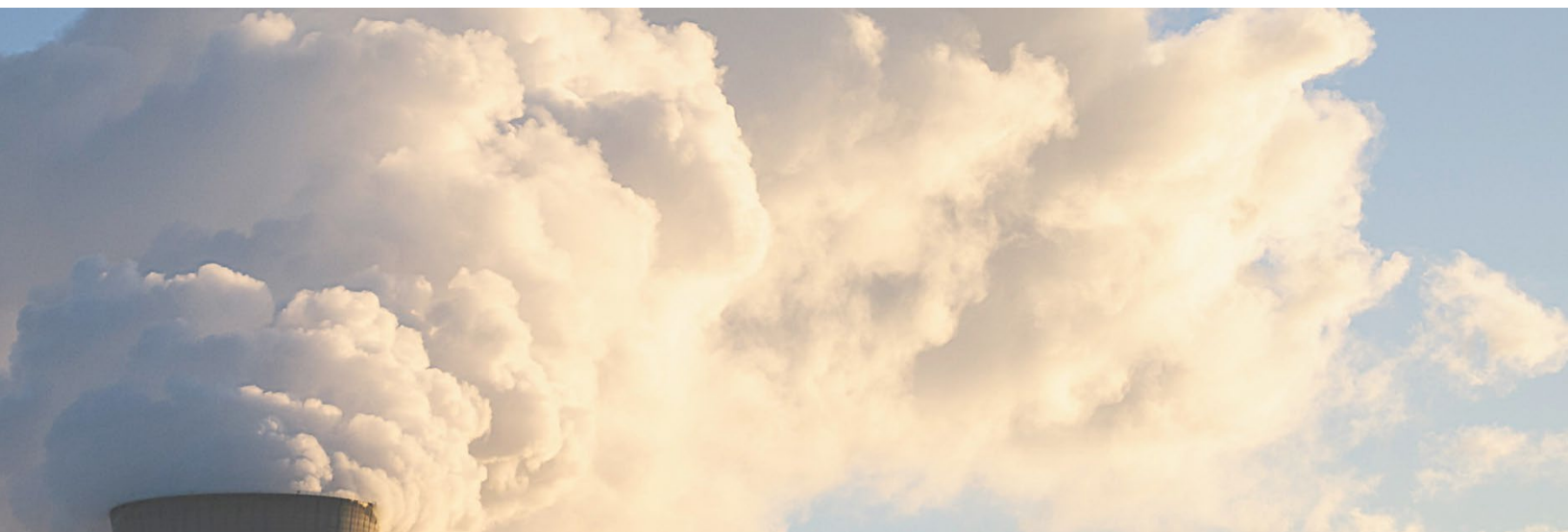
Resource Type	Year					25-year Total by Resource (Rounded)
	2030	2035	2040	2045	2050	
Nuclear	0	730	1,610	250	0	13,000
Offshore Wind	0	1,370	3,640	0	0	25,000
Utility-Scale Solar	0	0	-160	760	30	3,000
Distributed Solar	90	120	120	120	120	3,000
Battery Storage	0	130	-380	1,500	3,420	23,500
Total by Year (Rounded)	90	2,400	4,800	2,600	3,600	67,500

²¹ Estimates are based on the NREL 2024 Annual Technology Baseline Report (NREL, 2024). Resources used to develop the estimates were large nuclear, class 3 fixed offshore wind, class 8 solar photovoltaic, and utility-scale 8-hour battery storage. Operations and maintenance (O&M) expenses are not included. Additional information on O&M expenses is available in the Annual Technology Baseline Report. Readers are referred to NREL (2024) for further details.

²² Negative numbers in the table indicate that the Current Policy scenario built more of that resource in that year than the CCAP scenario, and incurred greater costs. Specifically, the Current Policy scenario assumes 3.5 GW of offshore wind will be built by 2040 while the CCAP scenario assumes 11 GW of offshore wind by that year. As a result, in the Current Policy scenario the model identifies a need for greater build-out of utility-scale solar and energy storage in 2040. The CCAP scenario, in contrast, selects to build less utility-scale solar and energy storage that year because of the ample power supplied by offshore wind. This is reflected in the table as negative numbers. For other years and categories, the CCAP scenario consistently builds more renewable and carbon-free resources each year than the Current Policy scenario, reflected in the table as positive numbers.

High Cost Estimate (NREL Conservative Scenario)

Resource Type	Year					25-year Total by Resource (Rounded)
	2030	2035	2040	2045	2050	
Nuclear	0	1,180	2,910	460	0	23,000
Offshore Wind	0	1,620	4,350	0	0	30,000
Utility-Scale Solar	0	0	-220	1000	40	4,000
Distributed Solar	110	180	170	170	170	4,000
Battery Storage	0	170	-530	2,230	5,450	36,500
Total by Year (Rounded)	110	3,200	6,700	3,900	5,700	97,500



STAKEHOLDER FEEDBACK

Public support for the transition to clean energy is strong. During public stakeholder meetings held by NJDEP during 2023, 2024 and 2025, participants consistently called for expanded reliance on renewable energy while maintaining affordability and reliability (NJDEP, 2025c). Specific requests were made for increased solar photovoltaic, offshore wind, and energy storage capacity, coupled with programs that make electrification "actually affordable" by way of better rate designs, incentives and public outreach.



"DEP, BPU and the NJ Governor's Office need to make this affordable. At the end of the day, people don't care about PJM, interconnection or other reasons for why the costs are high. I am trying to make the case to people that we need renewables and that pollution is killing them, but their pockets are killing them. We need more significant rebates." - Participant in DEP's Central & South Jersey Climate Action Virtual Community Listening Sessions held in June 2025



"Affordability is always going to be the focus. If we can't make clean energy affordable, then we can't make the case to make renewables happen." - Participant in DEP's Central & South Jersey Climate Action Virtual Community Listening Sessions held in June 2025



"Education is not getting in to the EJ communities. When I go into homes, people have everything plugged in, and are not aware of the little, easier things that can save a lot of energy (and money). Using less electricity is a large piece of the puzzle, not just electrifying everything and hoping clean energy sources are used over fossil fuels." - Participant in DEP's Central & South Jersey Climate Action Virtual Community Listening Sessions held in June 2025



Improving opportunities for community engagement and reducing bureaucratic barriers at the local and county levels were also identified as necessary to meeting the needs at the neighborhood level. As one Salem County resident noted,



"Salem County is one of the poorest counties in the state, and an EJ community where people aren't organized in the capacity to speak up and advocate as strongly to get a [clean energy or community solar] project moving again and getting the investments needed." - Participant in DEP's Central & South Jersey Climate Action Virtual Community Listening Sessions held in June 2025



Participants expressed reluctance to embrace fossil-dependent hybrid approaches such as hydrogen blending as well as new nuclear capacity, and favored renewable energy above all.



"The halt in OSW is not going to happen /continue on forever, we know this is route we need to take. We need to dispel the untruths (especially around OSW). Continue to have more conversations with scientists, more webinars with scientists and dispel the untruths with community members across the state. Decision makers with the people who have facts. It's up to us to continue to push the State forward with wind, solar and other renewable opportunities." - Participant in DEP's Central & South Jersey Climate Action Virtual Community Listening Sessions held in June 2025



"We need these wind farms off the coast for renewable energy." - Participant in DEP's Central & South Jersey Climate Action Virtual Community Listening Sessions held in June 2025



In addition, the importance of upgrading local distribution infrastructure, in particular in rural areas of southern New Jersey, was clearly expressed. Extensive stakeholder engagement was also conducted by NJBPU in public meetings on May 20, 22, 29 and June 3, 2024 as part of developing the 2024 Energy Master Plan. Five small-group stakeholder workshops were also organized in July and August 2024 to promote direct dialogue. On March 13, 2025, NJBPU also hosted a virtual public meeting to review and solicit public comment on draft results of the project. Members of the public echoed the concerns raised in their NJDEP comments: support for renewable energy, calls for genuine affordability, and a need for commitment to communities in the form of workforce partnerships and educational programs. The need for substantive upgrades to the State's energy infrastructure were made clear, including in the areas of energy efficiency, demand management, transmission and distribution network enhancements, increased grid capacity and modernization, and innovative rate designs, all in the service of greater grid reliability, affordability, and a clean energy future.



*"I think we need to focus on **infrastructure upgrades needed to allow for community solar** which are barriers and delay projects. And **we need to revitalize offshore wind**."* -Participant in DEP's Central & South Jersey Climate Action Virtual Community Listening Sessions held in June 2025



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INDUSTRY

CHAPTER 4



INDUSTRY SECTOR SNAPSHOT

2022 NJ EMISSIONS ACTIVITIES AND DATA

Industry emissions activities include on-site generation; process energy; non-process energy; and off-road equipment. The industry sector emitted 8.9 MMT CO₂e in 2022.

- Industry emissions
- Total GHG emissions from all other sectors

8.9

97.8

2022 Emissions (MMT CO₂e) (GWP₁₀₀)

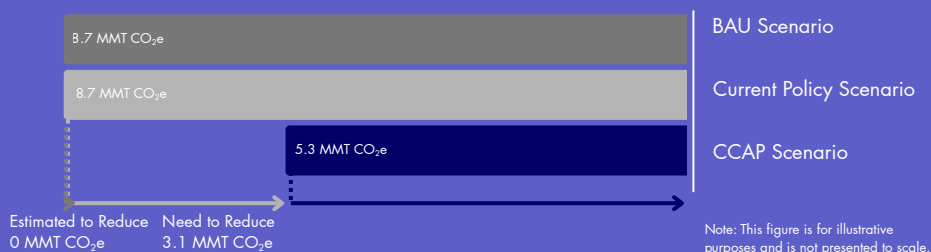
GHGS OF CONCERN

- Carbon Dioxide (CO₂)
- Black Carbon

EMISSIONS GOAL

5.3 MMT CO₂e

2050 EMISSIONS PROJECTIONS



GHG REDUCTION MEASURES AND ENABLING ACTIONS

Measure 1: Adopt manufacturing equipment efficiency standards and incentives for energy efficient technologies

- 1.1 Continue participation in multi-state organizations
- 1.2 Evaluate expanding appliance standards and/or benchmarking requirements to industrial entities
- 1.3 Pilot innovation energy efficiency and decarbonization technologies
- 1.4 Continue meaningful industrial stakeholder coordination
- 1.5 Evaluate reforms to electric cost structures for industrial customers to incentivize electrification

Measure 2: Implement a mandatory emissions reduction program for high-emitting sources in the industrial sector

- 2.1 Convene stakeholders to inform program design
- 2.2 Evaluate existing emissions reporting requirements and adopt a rule to establish a declining cap on emissions
- 2.3 Offer complementary clean manufacturing technical assistance and expand existing incentive programs for qualifying industrial facilities

OVERVIEW

The industrial sector¹ consists of the facilities and equipment used to produce, process, or assemble goods (USEIA, 2020). Overall, the sector is diverse. Building construction, heavy industry, highly specialized pharmaceutical production, food processing, and even farming all fall within the industrial category. In 2023, among the large stationary facilities reporting to the New Jersey Department of Environmental Protection's Emission Statement Program, petroleum refineries produced the greatest emissions at more than 2.7 million metric tons (MMT) carbon dioxide equivalent (CO₂e).² Other contributors included pharmaceutical manufacturing (0.3 MMT CO₂e), glass manufacturing (0.2 MMT CO₂e), and iron and steel mills (0.1 MMT CO₂e). Even so, large facilities only accounted for 42% of the State's industrial sector emissions, attesting to the substantial number of small and medium-sized manufacturing, construction, and agricultural enterprises that make up the foundation of New Jersey's economy.³

Greenhouse gases (GHGs) and climate pollutants of concern are emitted by the industrial sector through "direct" or onsite emissions, and via "indirect" emissions from offsite electric generation associated with the facility's electricity consumption. This chapter focuses exclusively on direct emissions. Indirect emissions are captured in other chapters of this report. Specifically, emissions from grid-supplied power consumed in the manufacturing process are accounted for in the electric generation sector; warehousing under the commercial sector; waste processing under the waste sector; and consumer products used for industrial processes under the halogenated gases subsector of the Highly-Warming Climate Pollutants Chapter. Direct emissions come from the consumption of fossil fuels for process energy, onsite electric generation and onsite non-road equipment, through chemical reactions and from fugitive emissions from industrial processes or equipment (USEPA, 2020). Energy consumption for manufacturing activity is largely used for process heating and cooling, and powering machinery, with a smaller portion used for facility heating, air conditioning, and lighting. Immediate emission reductions can be achieved through implementing energy efficiency measures. Greater reductions will be realized if there is an economy-wide transition away from fossil fuel energy and a subsequent decrease in production at refineries.

¹ An energy-consuming sector that consists of all facilities and equipment used for producing, processing, or assembling goods. The industrial sector encompasses the following types of activity: manufacturing (NAICS codes 31-33); agriculture, forestry, fishing, and hunting (NAICS code 11); mining, including oil and gas extraction (NAICS code 21); and construction (NAICS code 23).

² Based on GWP₁₀₀. GWP₂₀ values are nearly identical.

³ Agricultural activity generates emissions both by burning fossil fuels and as a consequence of biological activities. Because it makes a product, it is included in the industrial sector. However, because of their unique nature, emissions from soil management and livestock operations are discussed elsewhere in this report.

WHERE WE STAND

In 2022, the State’s industrial sector collectively emitted an estimated 8.9 MMT CO₂e, or 9% of New Jersey’s total net GHG emissions of 97.6 MMT CO₂e (NJDEP, 2025). The majority of these emissions are associated with fossil fuel consumption, while a small portion, 0.3 MMT CO₂e, is associated with carbon dioxide emissions from process chemistry. New Jersey currently accounts for fuel-based emissions in the industrial sector using fuel consumption data from the United States Energy Information Administration, and process emissions using the USEPA State Inventory Tool (USEIA, 2024) (USEPA, 2025). New Jersey also collects data via emission statements from permitted entities, which is utilized to inform GHG reduction strategies.

GHG emissions from the industrial sector declined from a high of 14.1 MMT CO₂e in 2005 to 8.5 MMT CO₂e in 2014, but have remained between 7.5 and 8.9 MMT CO₂e in subsequent years (Table 4.1). Since methane does not make a large contribution to these emissions the 20-year global warming potential (GWP₂₀) values are similar. Over the past two decades the State has experienced a shift from heavy industries like steel manufacturing to advanced technology industries such as life sciences, pharmaceuticals, biotechnology, and medical equipment manufacturing (NJEDA, 2019). At the same time, energy efficiency improvements and air quality protections have also played roles in the decreasing emissions from the industrial sector. The American Council for an Energy-Efficient Economy (ACEEE) ranking of energy efficiency nationwide indicates New Jersey’s efficiency ranks among the top ten of the states (ACEEE, 2025).

In 2022, the Industrial sector emitted an estimated 8.9 million metric tons of CO₂e. This represents 9% of New Jersey’s net emissions.

Table 4.1. Annual Industrial Sector Greenhouse Gas Emissions 2005 – 2022 (MMT CO₂e).

	2005	2006	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
GWP ₁₀₀	14.1	12.7	10.4	8.5	8.3	8.7	7.8	8.3	8.3	7.5	7.9	8.9
GWP ₂₀	14.2	12.7	10.5	8.5	8.3	8.7	7.8	8.3	8.3	7.5	7.9	9.0

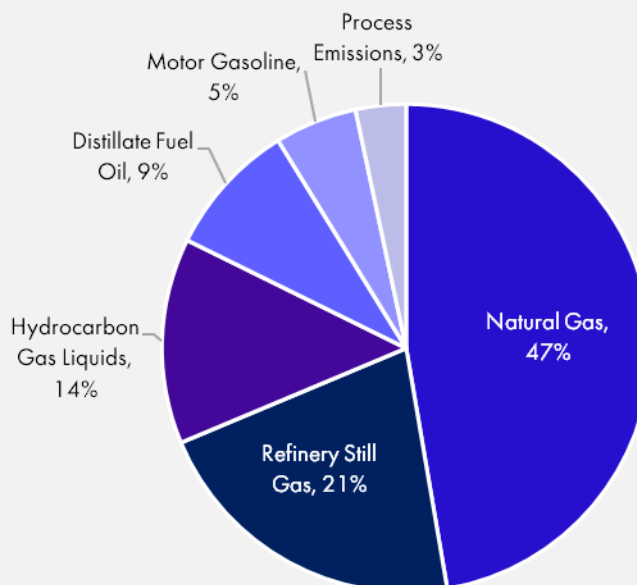
In 2022, the State’s industrial sector emissions were attributed to the use of the following primary fossil fuel types: natural gas (47% of emissions), refinery still gas (21%), hydrocarbon gas liquids such as propane and iso-butane (14%), distillate fuel oil (9%), motor gasoline (5%), and carbon dioxide released from manufacturing processes (3%) (Figure 4.1) (USEIA, 2024) (USEPA, 2025).

Generally, emissions are produced onsite at industrial facilities from four main activities:

- **Onsite Energy Generation:** Refers to the generation of heat, steam or electricity within the facility boundaries using fossil fuels or electricity. It covers three categories: (1) conventional boilers that produce steam, (2) combined heat and power/cogeneration to produce steam and electricity and (3) Onsite Electricity Generation, obtained through generators running on fossil fuels or renewable energy sources (USDOE, 2019a). Onsite generation supports process and non-process electrical and thermal load.
- **Process Energy:** Refers to the energy used to convert raw materials into manufactured products. It includes process heating, cooling, refrigeration, machine drive, electrochemical processes, and other process uses (USDOE, 2019a).
- **Non-Process Energy:** Refers to energy used for purposes other than converting raw materials into end products, including; energy used for heating, ventilation and air conditioning (HVAC), facility lighting, onsite transportation, cooking, water heating and other non-process uses (USDOE, 2019b).
- **Non-Road Equipment:** Refers to energy burned in medium- and heavy- duty equipment, including bulldozers, excavators, cranes, and other non-road vehicles moving goods, materials, and personnel onsite. Use of non-road equipment is particularly prevalent at many waste processing facilities, such as recycling facilities and landfills. This is discussed in the Black Carbon section of the Highly Warming Climate Pollutants chapter of this report.

Figure 4.1. Industrial Emissions Sources during 2022 by Percentage. Total 8.9 MMT CO₂e (GWP₁₀₀).

Natural gas was responsible for nearly half of industrial sector emissions. Still gas, a byproduct of petroleum manufacturing, and hydrocarbon gas liquids such as propane and isobutane, together contributed 35%. Gasoline and distillate fuel oil added another 14%. Process emissions are carbon dioxide released by chemical reactions during manufacturing added 3%.



Business-as-Usual & Current Policy Scenario

In order to compare the relative impacts of various policy alternatives, it is useful to establish a baseline scenario. This baseline scenario represents what happens without significant policy or technological advances. The industrial sector Business-as-Usual (BAU) projection assumes the following circumstances:

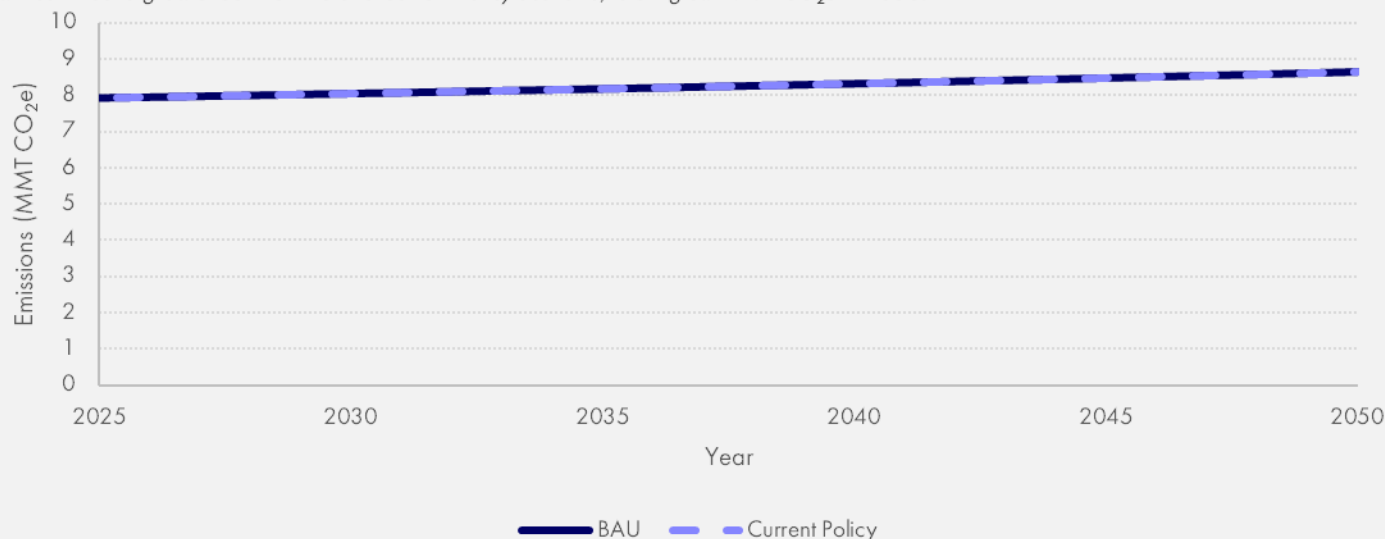
- No emission reduction measures are implemented; and
- No significant technological or industry changes.

For the purposes of this chapter, the Current Policy Scenario assumed the same circumstances as the Business-As-Usual Scenario. If New Jersey stays on a (BAU) path, emissions from the industrial sector and emissions from industrial processes and product uses (IPPU)⁴ would see a slight increase in annual emissions from 2021 by 2050, with annual industrial and IPPU emissions projected to be around 8.7 MMT CO₂e in 2050 (Figure 4.2.).

⁴ IPPU emissions in this chapter do not include ozone depleting substances substitutes or electrical transmission and distribution, which are included in the Highly Warming Climate Pollutants analysis.

Figure 4.2. Industrial Sector and Including Industrial Processes and Product Use (IPPU) 2020-2050 GHG Emissions Projection in the Business-as-Usual and Current Policy Scenario.

Emissions will continue to grow under the BAU and Current Policy Scenario, totaling 8.7 MMT CO₂e in 2050.



Critical Emissions Reduction Policies Adopted Since 2020⁵

New Jersey's existing emissions reduction efforts consists of laws, rules, and policies seeking to reduce energy usage and emissions from the industrial sector.

Emissions Reporting

As part of its New Jersey Protecting Against Climate Threats (NJ PACT) initiative, the Department of Environmental Protection (NJDEP) amended its emission statement rules, N.J.A.C. 7:27-21, to require sources of methane with a potential to emit 100 tons or more annually to report their emissions. Industrial sources reporting under this rule were already reporting non-methane emissions to NJDEP but now need to report methane emissions.

NJBPU Clean Energy Program

As discussed in the Residential and Commercial Chapter, the New Jersey Clean Energy Program (NJCEP), The New Jersey Economic Development Authority (NJEDA) and energy utilities offer incentives for the industrial sector pursuing energy efficiency, building decarbonization, and demand response. The NJCEP's Large Energy Users Program encourages participants to streamline investment in large-scale energy efficiency projects such as combined heat and power projects, facilitating GHG emission reductions at these facilities. In fiscal year 2025, \$13.9 million was dedicated to energy efficiency incentives in the commercial and industrial sectors, resulting in annual energy savings of 11.1 GWh of electricity and 41.8 MMBtu of gas and other fuels (NJCEP, 2025). The NJCEP also tracks the related emission reductions, and in their most recent fiscal year 2025 data, emissions avoided from the commercial and industrial sectors were 7,522 metric tons of CO₂ annually (NJCEP, 2025).

NJEDA's RETROFIT NJ Program

The NJEDA announced it will be launching the Reducing Emissions through Retrofits, Optimization, Fuel-switching, and Innovative Technologies (RETROFIT NJ) Grant Program in October, 2025. The \$75 million pilot program will provide financial assistance for hard and soft costs to multi-pronged, large-scale retrofit projects that enable holistic energy improvements at buildings, campuses, and multi-building facilities – including Class 4B: Industrial Properties.

⁵ Refer to the 80x50 GWRA report for a summary of relevant policies prior to 2020.



THE PATH FORWARD

The BAU and Current Policy scenarios show that if no additional action is taken, the emissions from New Jersey's industrial sector would rise by 10%, or 0.8 MMT CO₂e, by 2050. The CCAP Scenario found that emissions can be reduced to 5.6 MMT CO₂e by 2050, if the state achieves a 26% improvement in manufacturing energy efficiency and electrifies 25% of natural gas and petroleum fuel use by 2050 (Figure 4.3). Realizing energy efficiency improvements, is considered a no regrets strategy for the industrial sector, as it remains one of the most cost effective and proven avenues for reducing emissions from industry (US DOE, 2022).

Furthermore, it is relevant to note that petroleum refineries are the largest industrial source of both CO₂ and methane required to report under NJDEP's Emission Statement Program, accounting for approximately 3 MMT CO₂e annually. New Jersey is one of 11 states whose refineries produce 20% or more of the state's total industrial sector emissions. While there may be limited near term opportunities to reduce direct emissions from in-state petroleum refineries, significant emission reductions will be realized with the economy-wide transition away from fossil fuel use envisioned in this plan's CCAP Scenario. New Jersey will continue to partner with other states where refineries operate to coordinate an effort to work with these companies to develop strategies to advance innovation and reduce emissions nationwide, as the economy transitions away from fossil fuel use.

2050 SECTOR EMISSION GOAL

5.6 MMT CO₂e

EMISSION ACTIVITIES

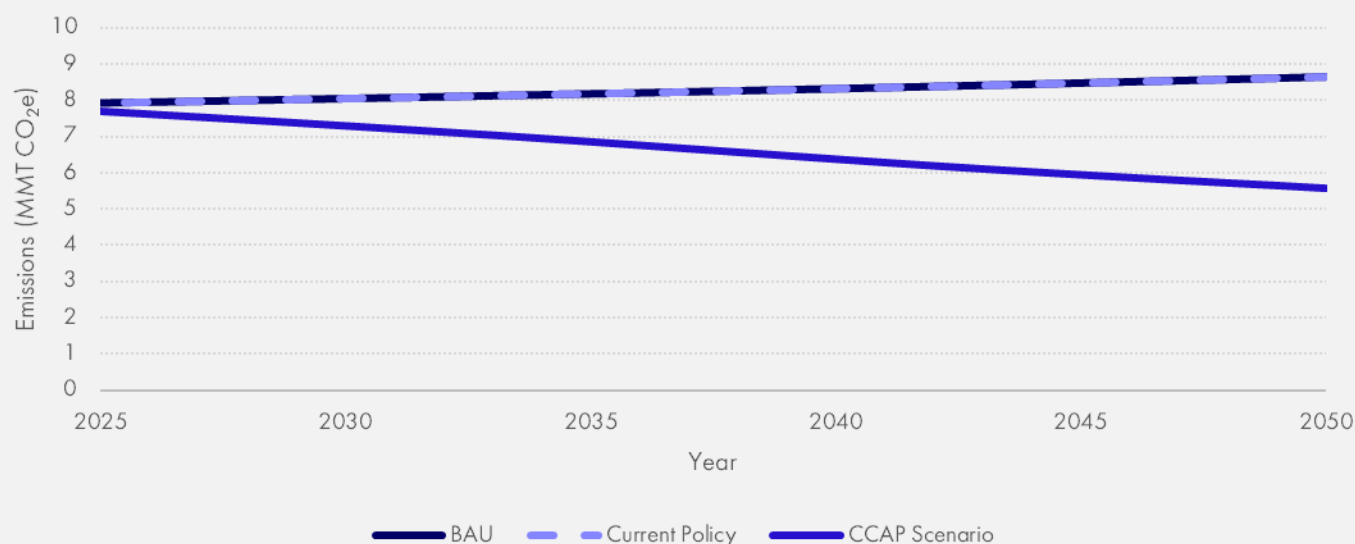
- On-Site Generation
- Process Energy
- Non-Process Energy
- Off-Road Equipment

EMISSIONS REDUCTION MEASURES

1. Adopt manufacturing equipment efficiency standards and incentives for energy efficient technologies in manufacturing.
2. Implement a mandatory emissions reduction program for high-emitting sources in the industrial sector.

Figure 4.3. Projected Industrial Sector Emissions Including IPPU emissions under the CCAP Scenario.

Under the CCAP Scenario, emissions fall to 5.6 MMT CO₂e by 2050.



The State must continue to take decisive action to realize the CCAP Scenario and significantly ramp up efforts to mitigate emissions to achieve its goal of curbing sector emissions to 5.6 MMT CO₂e by 2050. Due to the complexity of mitigating emissions from the industrial sector, NJDEP identified two measures that could be implemented to achieve the scale of emissions reductions envisioned for the industrial sector:

- **Measure 1:** Adopt manufacturing equipment efficiency standards and incentives for energy efficient technologies in manufacturing.
- **Measure 2:** Implement a mandatory emissions reduction program for high-emitting sources in the industrial sector.

Implementing a combination of policies based on the above measures can accelerate the reduction of industrial sector emissions towards the goal of ≤5.6 MMT CO₂e by 2050.

Emissions Reduction Measure 1: Adopt manufacturing equipment efficiency standards and incentives for energy efficient technologies.

In order to ensure the state realizes the level of industrial sector emissions reductions envisioned in the CCAP scenario, New Jersey should consider the adoption of rules that would require manufacturers of new equipment used in manufacturing to meet energy efficiency standards. The State could also consider expanding its current energy benchmarking law to include industrial facilities and buildings in any future adoption of building performance standards (BPS). To complement and assist industries in implementing changes, the State should create additional incentives and provide technical assistance that would support the installation of industrial heat pumps, thermal batteries, and other energy efficient technologies and equipment.

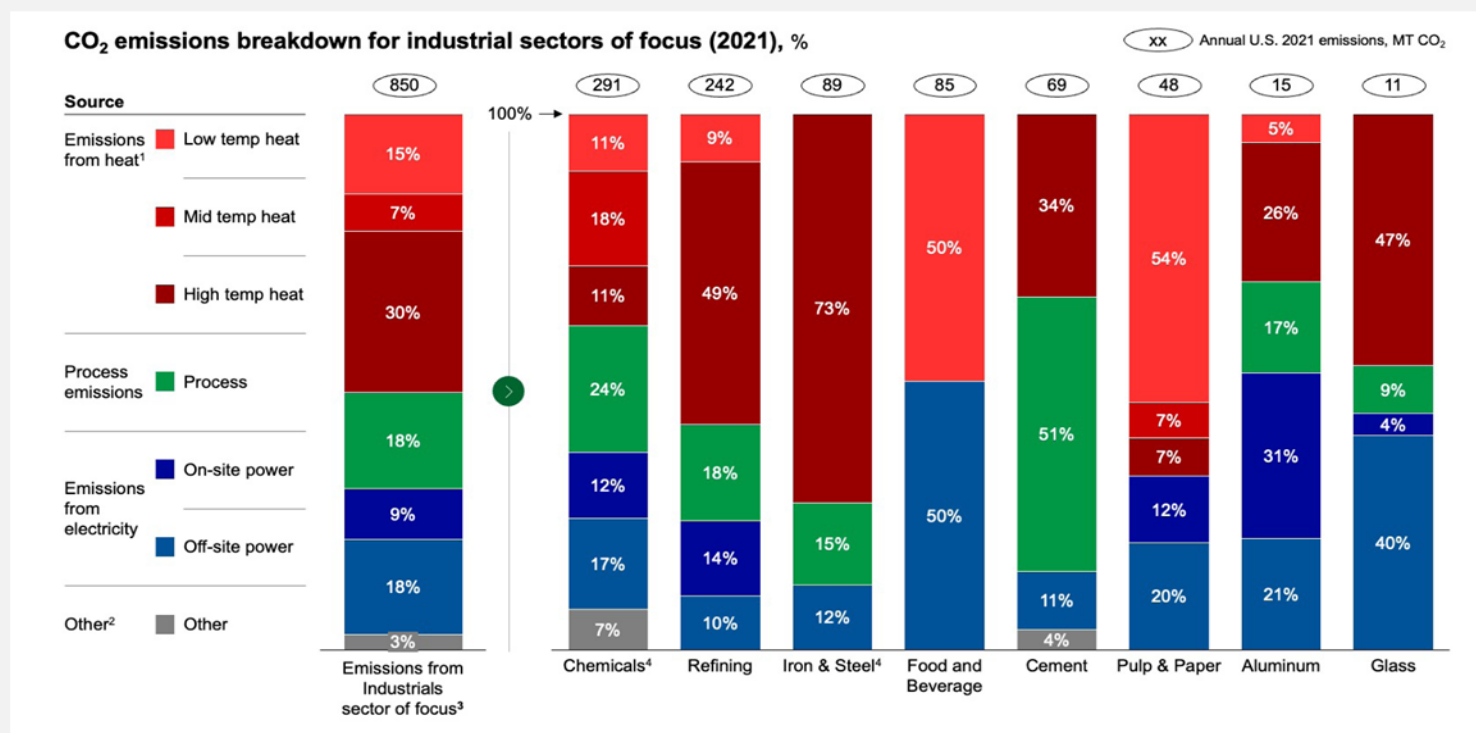
While manufacturing energy efficiency standards that dictate the minimum energy performance for manufacturing equipment sold and used in the US are primarily set by the US Department of Energy, California has enacted manufacturing equipment efficiency standards (Title 20) that go beyond the federal standards, particularly for industrial equipment such as compressors (18-AAER-05), fans and blowers (22-AAER-01) (California Energy Commission, 2025). California has also adopted Building Energy Efficiency Standards which include requirements under the State's energy code for new and altered non-residential buildings, including factories, to reduce overall energy consumption; requirements for industrial process pipe installation to reduce heat loss; and established standards for various equipment

used in industrial and commercial settings such as boilers, water heaters, and heating ventilation and air conditioning (HVAC) systems (California Energy Commission, 2025). New Jersey's current appliance standards law (P.L. 2021, c.464) does not include manufacturing equipment or cover equipment used in industrial facilities like compressors, fans and blowers. New Jersey could pursue the adoption of California standards or similar standards for manufacturing equipment efficiency.

Furthermore, there is ample opportunity for the State to incentivize the adoption of energy efficiency technologies and encourage the switch from burning fossil fuels for process heat to electricity. While few scalable methods exist today for generating large quantities of high temperature heat, other than burning fossil fuels and using process gases (McKinsey, 2017), there are several scalable alternatives for generating low and medium temperature heat which accounts for more than a third of combustion emissions from the industrial sector in the US (Bauer, et al., 2024) (RMI, Unpublished, 2025). Industrial heat pumps (IHP) and thermal batteries are two such scalable alternatives for generating low and medium temperature heat using electricity. As the electricity grid decarbonizes, IHPs are an existing technology that can be deployed to electrify manufacturing in industries that rely on low and medium temperature heat such as food and beverage, glass, pulp and paper, and chemical production (Figure 4.4). IHPs not only produce zero-direct emissions (Industrial Innovation Initiative, 2024), but they are also three to five times more efficient than traditional boilers when used for low and medium heat (McKinsey, 2023). Similar to residential heat pumps, IHPs work by compressing and transferring heat from one place to another. However, compared to residential or commercial building heat pumps, IHPs convert lower-temperature ambient or waste heat into much higher-temperature, useful heat. Typical IHPs transfer two to three times more process heat than the energy required to drive them, meaning they frequently outperform fossil-fuel boilers (NYSERDA, 2023). Additionally, IHPs can provide other benefits compared to fossil fuel combustion heating including: better response times, less maintenance, cleaner, and compact and able to be located closer to heat sinks thereby reducing losses and increasing efficiency (Industrial Innovation Initiative, 2024).

Figure 4.4. US 2021 GHG Emissions for Industrial Sectors of Focus by Source.

Pulp and paper, food and beverage, chemical production pose high potential for electrification (through applications like IHPs and thermal batteries) since a significant portion of their emissions are from low and mid temperature heat. The chart also shows that there may be potential for electrification to reduce certain emissions in other industry sectors such as aluminum and even refining.



This image is a chart from the United States Department of Energy's (USDOE) Pathways to Commercial Liftoff: Industrial Decarbonization Report from September 2023 accessed via report co-author, Lucia Tian's website (US DOE, 2023).

Industries continue to face several barriers to deploying industrial heat pumps, namely cost effectiveness. While studies have found heat pumps to be cost competitive with new natural gas boilers in a few cases (for $<100^{\circ}\text{C}$ heat output ranges), industrial heat pumps and electric resistance heat with and without thermal battery storage remain more costly upfront than new and existing gas boilers (Energy + Environmental Economics (E3), 2024), suggesting there may be an opportunity for state-level incentives and enactment of policies to reduce their costs. Additionally, there may be opportunities for reducing emissions related to low temperature process heating from other means like solar thermal, microwave and infrared technologies which can provide heat at or below 150°C (Industrial Innovation Initiative, 2024).

A thermal battery is a device that stores and releases energy as heat, using various materials like molten salts, bricks, or water to absorb and hold thermal energy. These systems charge by converting electricity into heat and then discharging the stored heat for heating applications, industrial processes, or even back into electricity, offering benefits such as reducing waste from renewable sources, decarbonizing heavy industries, and providing long-duration energy storage (RMI, 2025). Because they typically produce heat in a broad temperature range from 149° to more than $2,000^{\circ}\text{C}$, thermal batteries offer a zero-emission, potential clean heating solution for industrial sectors that utilize high temperature heat (like steel and cement) in addition to low-and medium temperature heat (Industrial Innovation Initiative, 2024). These systems store heat with minimal losses and have the ability to charge intermittently from both grid-connected and off-grid sources. This means that compared to other emerging technologies like hydrogen-based systems, thermal battery systems have the ability to dramatically lower energy costs for industrial facilities by enabling them to rely on off-grid variable renewables or the purchase of grid-electricity only in the hours of the day when it is cheapest (Industrial Innovation Initiative, 2024). Additionally, thermal batteries also have the potential to help improve grid stability because they can store low market-value renewable energy and release it locally as heat over time, reducing the need for building more transmission infrastructure and even provide backup energy for a facility or the broader grid when renewable electricity production is low (Industrial Innovation Initiative, 2024). However, deployment of these systems is hindered by a facility's access to low-cost electricity and ability to adapt existing complex high-temperature heat facilities to integrate new sources of heat production like thermal batteries (RMI, 2025). New Jersey should continue to support the development of this technology and take steps to reduce barriers to more widespread adoption.

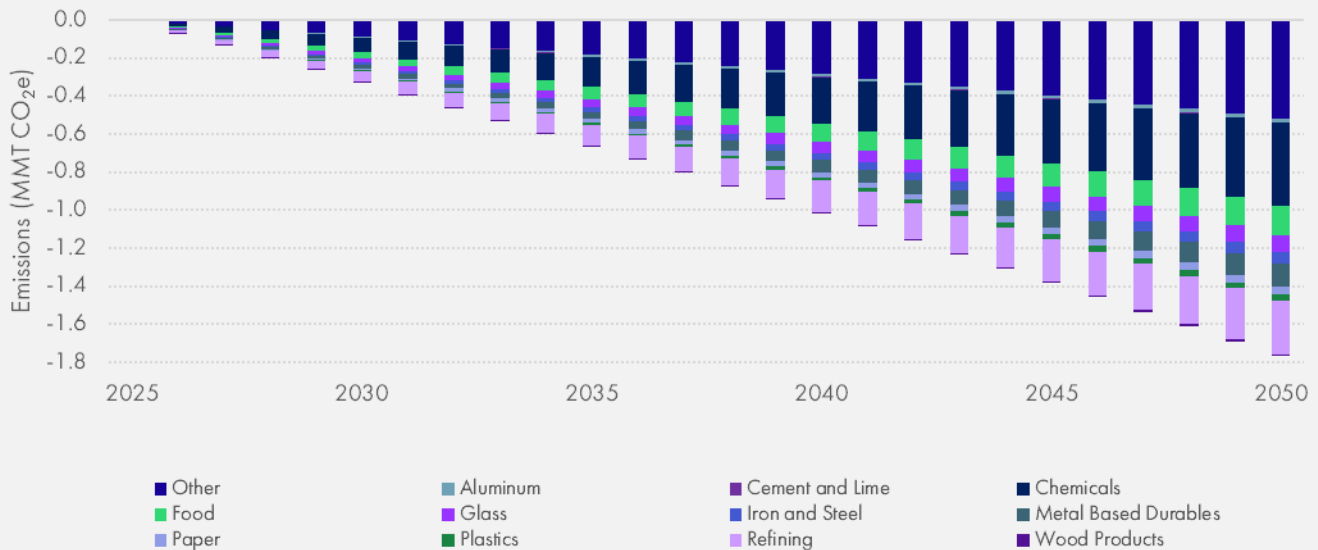


Source: BBC News, Man Energy Solutions, Industrial Heat Pump. 2023.

Measure Quantification

NJDEP estimates that if New Jersey were to implement regulations requiring gradual increases in various manufacturing equipment energy efficiency over time in 12 major industrial subsectors⁶, the state could see a reduction in annual industry emissions of about 1.8 MMT CO₂e by 2050, and total cumulative reduction of more than 22 MMT CO₂e by 2050 (Figure 4.5).

Figure 4.5. Annual Emissions Avoided by Measure 1, Adopt Manufacturing Equipment Efficiency Standards and Incentives for Energy Efficient Technologies.
By adopting Measure 1, New Jersey would realize the greatest emissions reductions from industrial sources associated with the chemical, food and refining industries.



Priority Enabling Actions

NJDEP has identified five critical enabling actions to support achievement of Measure 1.

Enabling Action 1.1 Continue participation in multi-state organizations

NJDEP should continue to participate in the multi-state groups holding regularly scheduled meetings hosted by the United States Climate Alliance (USCA) and Northeast States for Coordinated Air Use Management (NESCAUM) to identify low emission and zero emission equipment opportunities in the industrial sector. This is particularly relevant to ensure that NJDEP is staying up to date on cutting-edge technologies and innovations in the field of emissions reductions.

Enabling Action 1.2 Evaluate expanding appliance standards and/or benchmarking requirements to industrial entities

New Jersey should evaluate the options for adopting industrial manufacturing equipment efficiency standards. Possibilities may include expanding the State's current appliance standards law to include manufacturing equipment or cover equipment used in industrial facilities like compressors, fans and blowers, or pursuing the adoption of California standards or similar standards for manufacturing equipment efficiency to realize GHG emission reductions in the industrial sector. These efforts would require legislative action.

In a similar vein, in its current form, New Jersey's Energy and Water Benchmarking Program applies to commercial buildings greater than 25,000 square feet and excludes industrial buildings (NJBPU, 2022). The State could evaluate the potential to expand benchmarking requirements to industrial buildings and, further into the future, consider adopting industrial building performance standards. These efforts will also require legislative action. The state of Maryland is

⁶ Energy efficiency improvement assumptions by 2050 were based on typical to state-of-the-art energy use reductions for industries included in the NREL Industry Energy Tool (McMillan & Narwade, 2018). Other industries used manufacturing energy efficiency improvement assumptions from ACEEE Halfway There report (Nadel & Ungar, 2019).

serving as a regional pilot for these efforts, as they are undergoing a cost-benefit analysis of building energy performance standard policy options, which is to include recommendations for incorporating manufacturing buildings that are 35,000 square feet or larger (Maryland Constitution, art. II § 17(c), 2025).

Enabling Action 1.3 Pilot innovation in energy efficiency and decarbonization technologies

The State should dedicate funding toward providing technical assistance to evaluate and offset the cost to replace existing industrial fossil fuel on-site power and process heat equipment with clean energy or zero/low emission alternatives, specifically piloting industrial heat pumps and thermal batteries. These New Jersey specific pilots are critical to serve as proof of concept and to inform the development of future emissions reduction policy. NJEDA's Green Bank, among other financial programs, could dedicate funding to the industrial sector. Additionally, funding should also continue to be dedicated to traditional energy efficiency projects at industrial facilities, such as the New Jersey Clean Energy Program's Large Energy Users Program and energy utilities' incentive offerings for energy solutions, custom, and prescriptive equipment upgrades (NJCEP, 2024; NJBPU, 2024). The public health benefits from these investments may be realized most prominently in the State's overburdened communities since manufacturing and other industrial facilities are disproportionately located in and adjacent to those communities. Investments in energy-efficient and clean equipment in New Jersey's manufacturing and other industrial facility types can also lead to new quality jobs as technicians are trained to install, operate or maintain equipment.

Enabling Action 1.4 Continue meaningful industrial stakeholder coordination

New Jersey state agencies should continue to engage with industries to identify barriers to energy efficiency and decarbonization. Industry collaboration is vital due to the technically challenging nature of industrial decarbonization. Because industrial processes vary immensely and are often site specific the State should expand its ongoing efforts to coordinate with specific industries. Notably, in the fall of 2024, NJDEP released an industrial decarbonization survey to begin this critical engagement. Moving forward, NJDEP should build upon this engagement by collaborating with NJEDA and explore sector specific focus groups. While industrial decarbonization can be challenging, NJDEP, NJBPU, and other state agencies can provide additional guidance and technical support for organizations and facilities that are interested in taking initial steps toward improving their energy efficiency and reducing their GHG emissions. This can be done by communicating the successes of industrial decarbonization demonstration projects currently underway in other states; promoting voluntary programs like the United States Department of Energy's (US DOE) 50001 Ready Program⁷ and Better Plants Program⁸, which offers free technical assistance to participating manufacturers; and providing state-led technical assistance similar to what NJDEP provides to businesses for developing sustainability plans. NJDEP, itself or via a contractor, could assist organizations with how to utilize free resources such as the US DOE's Industrial Facility Action Plan Template⁹ and the 50001 Ready Navigator to improve efficiency.¹⁰

Enabling Action 1.5 Evaluate reforms to electric cost structures for industrial customers to incentivize electrification

Utility demand tariffs are structured in such a way that drawing load during peak hours contributes to making electricity a non-competitive input fuel, compared to natural gas. The State should evaluate the potential to develop alternative cost structures which lower the overall barrier of electricity cost. Policies should be considered that incentivize the use of electricity when renewable penetration is highest to further the State's decarbonization goals. Additionally, aligning industrial operations with grid needs is a critical component to managing energy demands as the State anticipates heightened peak loads under an electrified future. The State can advance regulations that enable or encourage industrial customers to manage their energy consumption more effectively. These policies will be critical looking ahead, as New Jersey continues to build significant renewable generation.

⁷ <https://betterbuildingsolutioncenter.energy.gov/iso-50001/50001-Ready>

⁸ <https://betterbuildingsolutioncenter.energy.gov/better-plants>

⁹ <https://betterbuildingsolutioncenter.energy.gov/resources/industrial-facility-action-plan-template-blank>

¹⁰ <https://navigator.lbl.gov/>

Table 4.2. Measure 1 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Continue participation in multi-state organizations	Ongoing	NJDEP
Evaluate expanding appliance standards and/or benchmarking requirements to industrial entities	Ongoing	NJDEP, NJBPU, Legislature
Pilot innovation energy efficiency and decarbonization technologies	Near-Term	NJBPU, NJDEP, NJEDA
Continue meaningful industrial stakeholder coordination	Near-Term	NJBPU, NJDEP, NJEDA
Evaluate reforms to electric cost structures for industrial customers to incentivize electrification	Mid-Term	NJBPU

Table 4.3. Measure 1 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
Medium
Secured Funding
- New Jersey will continue to support industrial equipment and building energy efficiency efforts through its existing ratepayer funded pools of money such as the societal benefit charge (SBC), state appropriations, regional greenhouse gas initiative proceeds, and via targeting federal grants. - NJBPU and NJDEP have committed staff resources toward the continuation of the New Jersey's participation in the USCA and NESCAUM industrial sector initiatives addressing the industrial sector. - The Electric Discount and Energy Competition Act established an energy efficiency and renewable energy fund within the New Jersey Board of Public Utilities. A portion of these funds are directed to the Commercial and Industrial sector within New Jersey.
Funding gaps + opportunities
All enabling actions described in this measure would benefit from additional funds. More funds would allow New Jersey to expand and implement all enabling actions on a wider scale, achieving deeper decarbonization. New Jersey will continue to pursue federal funding opportunities as they become available to build upon these efforts. Several state funding sources could be utilized to improve industrial sector energy efficiency, and facilitate emission reductions within the industrial sector that are described in this measure: - NJEDA administered, New Jersey Green Bank State Debt Product, which offers loans of \$1-20M for building retrofits that will reduce emissions. - NJEDA's RETROFIT NJ - NJBPU CEP's Large Energy Users Program - NJEDA's Regional Greenhouse Gas Initiative (RGGI) proceeds
Geographic Scope
Statewide
Authority to Implement
Subject to further legal review: NJDEP has broad authority to implement policies and programs to prevent, control, and prohibit air pollution throughout the State, including programs of education. See N.J.S.A. 13:1D-9, 26:2C-1, however NJDEP would need authority to implement energy efficiency requirements. NJBPU and energy utilities have existing authority to implement industrial sector decarbonization programs. See P.L. 2018, c. 17. However, NJBPU would need legislative action to expand the benchmarking program to industrial entities.

Metrics for Tracking Progress

New Jersey will continue to track total energy consumption within the industrial sector as one metric for evaluating the success of implementing energy efficiency and renewable energy measures.

Emissions Reduction Measure 2: Implement a mandatory emissions reduction program for high-emitting sources in the industrial sector

New Jersey should consider implementing a mandatory emissions reduction program for high emitting sources in the industrial sector. The program could set a declining cap on emissions from sources that emit 25,000 MT/year or greater, to reduce emissions by a specific percentage (25%) below baseline levels by 2050. Such a program could be modelled after the State of Colorado program which targets the industrial sector with an increasingly tightening emission cap, paired with a cap-and-trade program for financial support to industrial entities.

In July 2021, Colorado adopted the Colorado Environmental Justice Act¹¹, which requires the state's industrial sector to reduce its GHG emissions 20% by the year 2030, compared to 2015 emissions. In October of 2021, Colorado adopted the GHG Emissions and Energy Management for Manufacturing rule, or GEMM 1, which covers four energy-intensive, trade-exposed Colorado facilities that emit over 25,000 metric tons of GHGs per year, and requires them to (1) demonstrate that they are using best available GHG emissions control technologies and energy best management practices through an audit process and (2) collectively reduce their emissions 5% by 2030. Colorado's air quality control commission adopted the GEMM 2 rule, on October 20, 2023. This rule, under Colorado Air Quality Control Commission Regulation 27, builds on GEMM 1,¹² and covers all facilities with manufacturing operations that emit 25,000 or more metric tons of GHG per year and requires them to collectively reduce emissions 20% by 2030. If New Jersey were to adopt similar rules it could ensure that industrial sector emission reductions envisioned in the CCAP scenario are achieved by 2050.

Measure Quantification

NJDEP estimates that a reduce and invest program for industrial manufacturing modelled after Colorado's GEMM, could yield significant emissions reductions. Under this approach, industrial manufacturing facilities that emit 25,000 or more MT CO₂e/y would be required to reduce emission 20% by 2032, while energy intensive and (EITE) trade-exposed industries would reduce emissions 5% by 2032. New Jersey could avoid more than 709,000 MT CO₂e annually by 2032 and cumulatively reduce industrial sector emissions by 15.6 MMT CO₂e by 2050 (Figure 4.6) through implementation of this program.

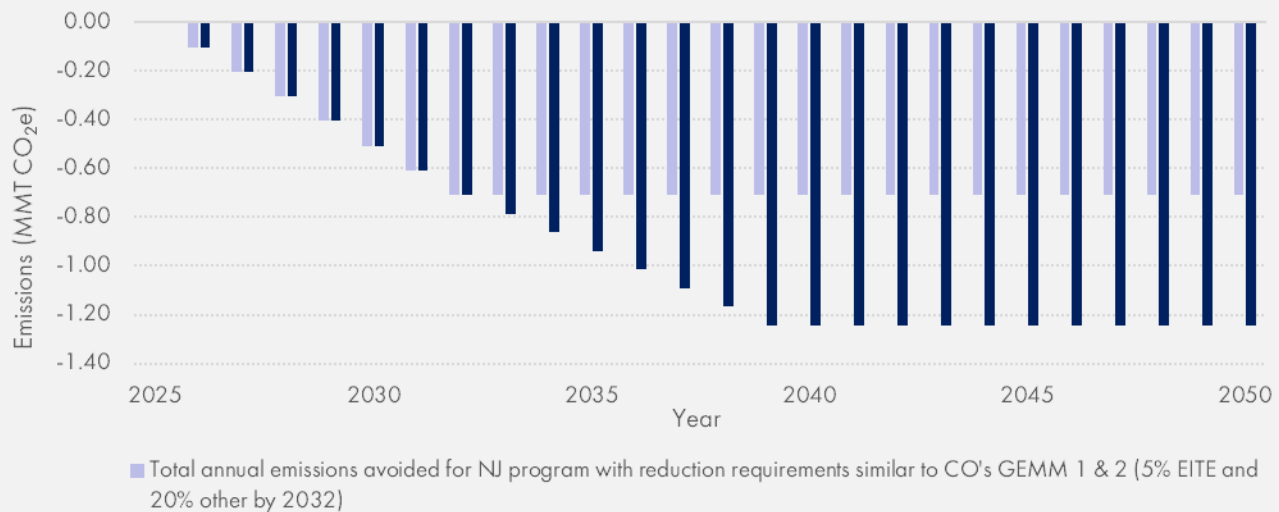
If New Jersey were to adopt more aggressive reduction targets for these industries that continued past 2032, the State could realize even more emission reductions. For instance if New Jersey were to set additional emission reduction requirements such as requiring EITE large emitting facilities to reduce their emissions 10% by 2039 and requiring all-other large industrial manufacturing facilities to reduce their emissions by 35% by 2039, New Jersey could avoid more than 1.2 MMT CO₂e in annual industrial sector emissions, and cumulatively reduce emissions from the industrial sector by more than 23 MMT CO₂e by 2050. This more aggressive industry emissions standard, when combined with expected emissions reductions from energy efficiency measures would likely be needed to realize the level of industry emissions reductions envisioned in the CCAP Scenario.

¹¹<https://leg.colorado.gov/bills/hb21-1266>

¹²<https://cdphe.colorado.gov/greenhouse-gas-emissions-and-energy-management-for-manufacturing-in-colorado>

Figure 4.6. Annual Avoided Emissions from Measure 2, Implementing a Mandatory Emissions Reduction Program for High-Emitting Sources in the Industrial Sector.

If New Jersey adopted a program with emission reduction requirements similar to Colorado's GEMM 1 & 2, the state, starting in 2032 would realize annual emissions reductions of 0.7 MMT CO₂e. If New Jersey adopted a more aggressive program, the state, starting in 2039, would realize annual emissions reductions of 1.2 MMT CO₂e.



Priority Enabling Actions

NJDEP has identified three critical enabling actions to support achievement of Measure 2.

Enabling Action 2.1 Convene stakeholders to inform program design

Meaningful engagement and dialogue is critical to ensuring sound policy. State agencies should formulate a plan to convene external stakeholders in a multi-year stakeholder process to inform future rule development. Key demographics to engage include industry groups, individual manufacturers, environmental groups and community advocates impacted by the legacy of industrial pollution. The hypothetical emission reduction program modeled for this measure is for illustrative purposes, to provide a sense of the GHG emissions a program like this could affect if designed similar to Colorado's program. If New Jersey were to craft a program through legislative action it could set the emission threshold at a different level (higher or lower than 25,000 MT), expand or restrict the applicable industry types, decide whether the program applies to individual sources or groups of sources, change the schedule for when reduction are required, and set a less or more aggressive decline in emissions over that time.

Enabling Action 2.2 Evaluate existing emissions reporting requirements and adopt a rule to establish a declining cap on emissions

NJDEP should evaluate its existing emissions statement program and GHG monitoring and reporting rule to determine the potential regulated community and if adequate data is currently available to establish a GHG emissions baseline to inform future regulatory developments. If New Jersey did create an emission reduction program like this, it could be tracked through the State's existing emission statement program.

Enabling Action 2.3 Offer complimentary clean manufacturing technical assistance and expand existing incentive programs for qualifying industrial facilities

Building upon enabling action 1.2 above, the State will need to offer technical assistance and incentive programs to help its industrial sector achieve mandatory emissions reductions. Similar to NJ Fleet Advisor Program, NJDEP should evaluate offering free personalized assistance to industrial and manufacturing companies seeking to maximize energy efficiency and decarbonization opportunities.

Table 4.4. Measure 2 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Convene stakeholders to inform program design	Ongoing	NJDEP
Evaluate existing emissions reporting requirements and adopt a rule to establish a declining cap on emissions	Near-Term	NJDEP
Offer complimentary clean manufacturing technical assistance and expand existing incentive programs for qualifying industrial facilities	Near-Term	NJBPU, NJEDA

Table 4.5. Measure 2 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
Medium
Secured Funding
- New Jersey will continue to support industrial equipment and building energy efficiency efforts through its existing ratepayer funded pools of money such as the societal benefit charge (SBC), state appropriations, regional greenhouse gas initiative proceeds, and via targeting federal grants. - The Electric Discount and Energy Competition Act established an energy efficiency and renewable energy fund within the New Jersey Board of Public Utilities. A portion of these funds are directed to the Commercial and Industrial sector within New Jersey.
Funding gaps + opportunities
All enabling actions described in this measure would benefit from additional funds. More funds would allow New Jersey to expand and implement all enabling actions on a wider scale, achieving deeper decarbonization. New Jersey will continue to pursue federal funding opportunities as they become available to build upon these efforts. Several State funding sources could be utilized to improve industrial sector energy efficiency and facilitate emission reductions within the industrial sector that are described in this measure: - NJEDA administered, New Jersey Green Bank State Debt Product, which offers loans of \$1 -20M for renewable energy (including transmission, interconnection and associated site remediation); electric battery storage, and building retrofits that will reduce emissions. - NJEDA's Manufacturing Voucher Program (MVP), which provides grants for new manufacturing equipment. - NJBPU CEP's Large Energy Users Program Garden State Commercial Property Assessed Clean Energy (C-PACE) Program - NJEDA's Regional Greenhouse Gas Initiative (RGGI) proceeds
Geographic Scope
Statewide
Authority to Implement
Subject to further legal review: NJDEP has broad authority to implement policies and programs to prevent, control, and prohibit air pollution throughout the State, including programs of education. See N.J.S.A. 13:1D-9, 26:2C-1. The NJDEP must still obtain statutory or regulatory authority to establish a declining cap on emissions from industrial manufacturing sources. NJBPU and energy utilities have existing authority to implement industrial sector decarbonization programs. See P.L. 2018, c.17.
Metrics for Tracking Progress
New Jersey will continue to track total energy consumption within the industrial sector as one metric for evaluating the success of implementing this measure.

STAKEHOLDER FEEDBACK

In late 2024, NJDEP developed and circulated an online survey to industrial facilities in the state. The purpose of the survey was to better understand what actions industrial facilities in New Jersey have taken or are considering taking related to increasing their energy efficiency and reducing GHG emissions. The survey was targeted at members of the NJDEP's Industrial Stakeholder Group (ISG). After promoting the online survey through a presentation to the ISG, email listservs, and direct phone calls to the 30 largest GHG-emitting industrial facilities in the state, NJDEP received 22 responses to the survey.

In analyzing the responses, NJDEP identified a perceived lack of return on investment and prohibitive capital investment as the most prominent barriers to facilities adopting energy efficiency and GHG emission reduction strategies. Results also indicated that out of 14 facilities where industrial heat pumps were applicable, only two were using them. Responses also suggest potential for the State to further support facilities to install combined heat and power systems, absorption chillers, thermal battery storage, on-site solar, electric boilers, and geothermal heating and cooling systems. Only three respondents have explored or implemented advanced leak detection systems for refrigerants or other gases or replacing HFC refrigerants with low-GWP alternatives, suggesting the need to provide further educational, technical assistance and incentives for highly-warming gas reduction activities at these types of facilities. Respondents indicated that zero-interest loans to bridge the period between concept and completion, and any government financial incentives or assistance would be critical in energizing the adoption of energy efficiency and emissions reduction projects. This need could potentially be addressed through the recently launched New Jersey Green Bank debt product and Garden State Commercial Property Accessed Clean Energy (C-PACE) offerings or through future clean manufacturing and industry focused incentives programs developed by state agencies, such as the NJEDA. NJDEP also heard support from multiple responding facilities for providing more state incentives coupled with improved communications, as it can be challenging to identify and keep up with available funding opportunities across their



"Some long-term projects like conversion to geoexchange still suffer from very high capital costs. Zero-interest loans to bridge the period between concept, and completion and IRA payback would be very helpful." - Responding facility in the DEP Industrial GHG Reduction Survey



"Our facilities are relatively small GHG emitters, but we have a net zero reduction goal. Because we aren't a large emitter, we generally don't qualify for grant funding at the federal level. Leveraging state programs will be an important part of achieving reductions and as we have facilities in many states, it can be challenging to identify and keep up with available funding opportunities." - Responding facility in the DEP Industrial GHG Reduction Survey



facilities in multiple states.

Both measures included in this chapter will reduce GHG emissions from industrial facilities which tend to be located in and around the state's overburdened communities. Measure 2 is directly responsive to stakeholder feedback collected from environmental justice stakeholders prior to and during the development of this plan that called for mandatory emission reductions in EJ communities.¹³ Stakeholders also called for the equal prioritization of reducing co-pollutants and GHG emissions.

Many of these industries produce co-pollutants such as NO_x and SO_x directly from their activities. The proposed measures will improve energy efficiency, reduce energy use, and facilitate the adoption of zero-emission technologies at these sites. These actions are expected to also reduce criteria and hazardous air pollutants in the state's overburdened communities where industry is disproportionately located. Since industrial manufacturing facilities that have their own on-site power generation through an electric generating unit (EGU) that is less than 25 MW are not subject to NJ's EGU Rule (N.J.A.C. 7:27F-2.1), this measure would be one approach for requiring further GHG emission reductions

¹³ This was emphasized by stakeholders at the listening sessions with Newark residents in Dec 2023, with Central and South Jersey participants held on June 16th, June 17th, and June 18th, 2025 and in Sheats et al. (2023). *Mandatory Emissions Reductions for Climate Mitigation in the Power Sector*. NJEJA. <https://njeja.org/wp-content/uploads/2023/11/MER-Report.pdf>.

(and subsequent co-pollutant emission reductions) at this subset of facilities. Furthermore, Measure 2 as proposed would require emission reductions in various industries (beyond those facilities which generate electricity) such as refineries, that are not currently subject to rules that require them to reduce GHG emissions. GHG reductions from these facilities are expected to also reduce co-pollutant emissions. While the proposed emission reduction program as described in measure 2 is focused on certain large manufacturing facilities, it hypothetically could be expanded to include more types of sources.

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WASTE & AGRICULTURE

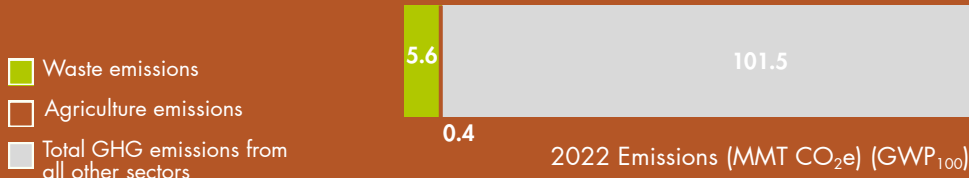
CHAPTER 5



WASTE & AGRICULTURE SECTOR SNAPSHOT

2022 NJ EMISSIONS ACTIVITIES AND DATA

Waste management emission activities include decomposition of food waste in landfills, venting and flaring of landfill gas, wastewater treatment, and digester gas. Agriculture sources include enteric fermentation and over-application of nitrogen-rich fertilizer. The waste sector emitted 5.6 MMT CO₂e and the agriculture sector emitted 0.4 MMT CO₂e in 2022.



GHGS OF CONCERN

- Methane (CH₄)
- Nitrous Oxide (N₂O)
- Carbon Dioxide (CO₂)

EMISSIONS GOAL

6.3 MMT CO₂e

2050 EMISSIONS PROJECTIONS



GHG REDUCTION MEASURES AND ENABLING ACTIONS

Measure 1: Adopt stricter rules and incentives for monitoring emissions, landfill caps, and odor controls at landfills and wastewater treatment facilities

- 1.1 Modify landfill monitoring and reporting regulations to include lower reporting thresholds for methane emitting facilities and adopt modern monitoring technologies
- 1.2 Evaluate adopting new control requirements on methane emissions
- 1.3 Encourage waste facilities to reduce landfilling of residuals

Measure 2: Expand regulatory requirements and incentives for food waste recycling and diversion

- 2.1 Amend the Food Waste Recycling and Food Waste-to-Energy Production Law
- 2.2 Require district solid waste management plans to prioritize food waste reduction and source separation of organic material
- 2.3 Support food waste recovery systems such as anaerobic digesters and co-digestion of food waste at wastewater treatment facilities
- 2.4 Implement regular statewide waste composition audits to track progress towards the goals of the Food Waste Reduction Act
- 2.5 Continue to pursue revisions to the Recycling Rules (N.J.A.C. 7:26A)
- 2.6 Expand State support for initiatives that encourage food waste prevention, recovery and distribute edible food before it is wasted

Measure 3: Encourage precision agriculture and utilization of compost on cropland and pasture

- 3.1 Revise recycling rules to streamline community composting and consider tiered permitting
- 3.2 Implement local and regional composting programs, expand availability of composting education classes
- 3.3 Encourage and incentivize precision agriculture; create guidelines for efficient fertilizer application

OVERVIEW

Waste management is the largest source of non-energy greenhouse gas (GHG) emissions in New Jersey. It consists of two separate subsectors; municipal solid waste (MSW) management and wastewater treatment (WWT), both of which are sources of methane and carbon dioxide (CO₂). MSW is generated by over 9.5 million residents and various commercial establishments such as businesses, restaurants, universities and hospitals. There are currently 12 active landfills in the state accepting waste. Emissions are largely attributed to the decomposition of the organic portion of the MSW stream. New Jersey also has approximately 300 facilities which collectively treat up to 6 billion gallons of domestic and industrial wastewater every day. These facilities emit GHGs through aerobic processes¹ which produce CO₂ and anaerobic processes² that primarily produce methane.³ The Intergovernmental Panel on Climate Change (IPCC) notes that while methane has a shorter lifespan than CO₂ in the atmosphere, it has a global warming potential 28 times greater than CO₂ over a 100-year period (IPCC, 2013) (IPCC, 2007).⁴

New Jersey's agricultural sector generates small amounts of methane, because farming here centers on growing marketable crops rather than meat and poultry production. In 2022, methane contributed 0.08 million metric tons carbon dioxide equivalent (CO₂e), mostly from enteric fermentation or the digestion of food in ruminant animals such as cattle, and from manure management. Nitrous oxide, another GHG, contributed 0.36 million metric tons (MMT) CO₂e, almost entirely from nitrogen fertilization of soils. Agricultural practices contributed a total of 0.44 MMT CO₂e in 2022, or about 0.5% of the State's net total GHG emissions.

Emissions generated from ancillary operations related to waste management facilities, such as the collection and transport of waste, and the consumption of electricity and energy to run these facilities, are accounted for in other chapters in this report. Additionally, industrial wastewater emissions represented less than 0.1% of the State's net total GHG emissions for 2022. However, emissions from industrial wastewater are not covered in this plan due to their comparative negligible impact.

¹ Aerobic treatment processes use microorganisms to break down biodegradable material in the presence of oxygen.

² Anaerobic treatment processes use microorganisms to break down biodegradable material in the absence of oxygen.

³ Anaerobic processes also produce CO₂. However, if the source of the waste was biological (that is, from recently grown plants as opposed to fossil-fuel based), the CO₂ does not represent a net addition to the atmosphere in the long run.

⁴ Methane has a roughly 28 times greater impact on climate than carbon dioxide over a 100-year period. This factor is referred to as the 100-year global warming potential, or GWP₁₀₀, and is taken from the IPCC Fifth Assessment Report. Over the first 20 years after following release to the atmosphere, methane has 84 times more impact, referred to as its 20-year global warming potential (GWP₂₀) value. USEPA and IPCC publish data based on GWP₁₀₀ values when reporting climate emissions; New Jersey provides data based on both GWP₁₀₀ and GWP₂₀.

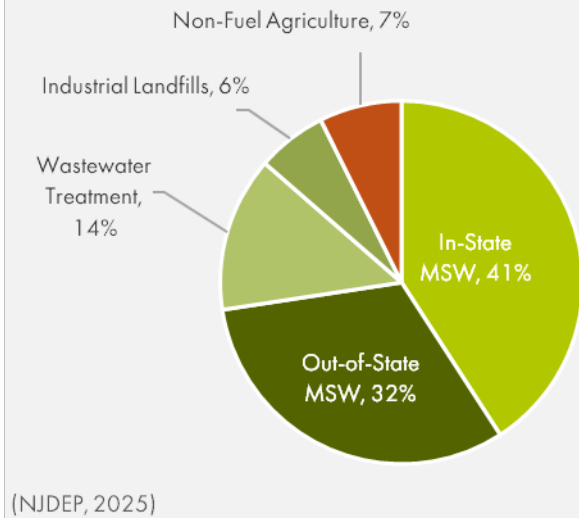
WHERE WE STAND

In 2022, the State's waste management and agriculture sectors collectively emitted 6.0 MMT CO₂e, or 6% of New Jersey's total net GHG emissions of 97.6 MMT CO₂e (NJDEP, 2025). Waste management is the largest source of non-energy related climate emissions. Non-fuel emissions from agriculture, including those from fertilizer application, manure management, and ruminant animals, were 0.4 MMT CO₂e, or 0.5% of 2022 net total.

In the combined Waste Management and Non-Fuel Agriculture sectors, MSW was responsible for 73% of the total GHG emissions from this sector in 2022. This includes GHG emissions from MSW processed and landfilled in New Jersey and the emissions from MSW landfilled out-of-state⁵. Emissions from industrial landfills added another 7%, wastewater treatment 13%, and non-fuel agriculture added 7%. (Figure 5.1).

New Jersey currently uses the United States Environmental Protection Agency's (USEPA) State Inventory Tool⁶ to calculate emissions from the waste and agriculture sectors. New Jersey also collects emissions data from some landfills through the New Jersey Department of Environmental Protection (NJDEP) Emissions Statement Program.

Figure 5.1. New Jersey Waste and Agriculture Sector Emissions in 2022.
Combined, waste and agriculture activities represented 6.0 MMT CO₂e.



Waste Management

Municipal Solid Waste

Between 2006 and 2022, emissions from MSW increased by over 60% (Table 5.1). In 2022 alone, over 10 million tons of MSW was generated in New Jersey, not including recycled materials.

Table 5.1. Solid and Industrial Waste Greenhouse Gas Emissions 2006 – 2022 (MMT CO₂e). Source: (NJDEP, 2025)

	2005	2006	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
GWP ₁₀₀	3.0	2.9	3.4	3.7	4.0	4.2	4.6	4.8	5.3	5.4	5.1	4.8
GWP ₂₀	8.9	8.6	10.2	11.2	11.9	12.6	13.7	14.4	15.8	16.3	15.3	14.3

Methane is created in landfills as microbes break down organic matter⁷, after which much of the gas will reach the atmosphere if not controlled. Food waste is the major source of organic matter that is landfilled and is estimated to be about 18% of New Jersey's MSW stream (NJDEP, 2022). A total of 31% of MSW is estimated to be compostable (the other 13% of compostable material being other organic material like grass clippings and yard waste) (Figure 5.2).⁸ Food waste that is landfilled in anaerobic conditions decomposes into biogas also known as landfill gas (or LFG).

⁵ Emissions from resources recovery facilities are accounted for in the electric generation chapter of this report.

⁶ The NJDEP used the USEPA State Inventory Tool Solid Waste Module, Wastewater Treatment Module and Agriculture Module to calculate emissions from these sectors.

⁷ The organic portion includes food waste (including both edible pieces of food and inedible portions like rinds and peels), yard waste (grass clippings and leaves, for example), and biomass waste (such as pet droppings), but does not include agricultural waste such as crop residues (which is accounted for separately). Other landfilled material would include things that do not break down easily in a landfill like metals.

⁸ NJDEP utilized the Municipal Solid Waste Quantification and Characterization of Burlington, Mercer & Passaic Counties Study (August 2022) to make statewide assumptions. <https://www.nj.gov/dep/dshw/recycling/WasteCharacterization.pdf>; estimates of waste stream are weighted based on county population and urban/suburban population.

During this process, CO₂ is also created in roughly equal proportion to methane. LFG also includes moisture, hydrogen sulfide, siloxanes, hydrogen, and various minor gases released from waste materials as they decompose. Alternatively, food waste can also be aerobically processed through composting, which primarily releases CO₂. Decreasing the amount of food waste entering landfills is a principal opportunity to reduce methane emissions. Alternative methods of food waste disposal such as aerobic composting can be low-cost, low-tech avenues for future emissions management.

In practice, modern landfills capture LFG as it is generated using collection wells and piping networks, after which the gas is typically burned in a flare or combusted to generate electricity. LFG is about 50% each methane and carbon dioxide by volume, with trace amounts of siloxanes and other impurities. This LFG can then be “cleaned” or “stepped up” and injected into natural gas pipelines, after equipment has been used to purify LFG into a methane-only product (USEPA, 2025a). Natural gas obtained in this way is one source of renewable natural gas (RNG), which is also available from anaerobic digesters. Of New Jersey’s twelve operational landfills, eight have had energy producing systems that allow them to use LFG on-site to produce heat or electricity, or to sell it back to the grid. However, four of these landfills are in the process of converting their systems over to RNG systems that will allow them to purify LFG into RNG and inject it directly into natural gas pipelines.

The resulting CO₂ from flaring and burning RNG does not represent a net addition of climate gases to the atmosphere because the carbon dioxide arises from natural sources (IPCC, 2006). LFG from older landfills may not be produced in sufficient quantity to support combustion, in which case it is sometimes vented directly to the atmosphere. These practices were originally introduced to reduce the buildup of combustible gas in the soil and its potential subsurface migration to nearby buildings where it could ignite. Controls were also applied for odor management. As a result, methane was still allowed to enter the atmosphere in reduced quantities so long as it did not catch on fire and there were no odors (Hickman, 1999; Tchobanoglous, 1993). Over time, however, it was recognized that these fugitive emissions contribute to air pollution, and LFG management is now an integral part of waste management operations under the Clean Air Act and state regulations (U.S. House of Representatives, 2025; NJDEP, 2024a). Nonetheless, landfills remain a source of fugitive methane emissions and therefore represent a long-term opportunity for enhanced climate emissions management.

Wastewater Treatment

Between 2006 and 2022, emissions from WWT remain largely unchanged (Table 5.2). Approximately 7 million people and numerous industries in New Jersey rely on public wastewater systems to collect and treat their wastewater. In New Jersey, approximately 40 WWT facilities utilize anaerobic digesters to process sludge from the collective treatment of up to 500 million gallons of wastewater a day. Over 200 facilities aerobically digest, through secondary treatment, up to 1.5 billion gallons (collectively) of domestic wastewater a day.

Figure 5.2. Estimated New Jersey Waste Composition.

Composition of NJ MSW stream, based on 2022 Waste Characterization study; weighted for county population.

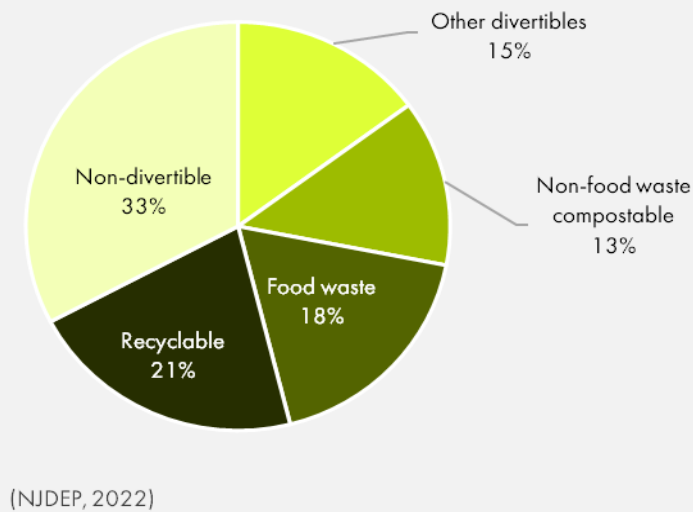


Table 5.2. Annual Wastewater Treatment Greenhouse Gas Emissions 2006 – 2022 (MMT CO₂e).⁹ (NJDEP, 2025)

	2005	2006	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
GWP ₁₀₀	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8	0.8
GWP ₂₀	2.0	2.0	2.0	2.0	2.0	2.1	2.1	2.1	2.1	2.1	2.1	2.1

Anaerobic digester gas is produced in a contained environment to minimize methane leakage. Over a quarter of New Jersey’s anaerobic WWT facilities have energy recovery systems generating electricity or heat from the produced digester gas that is fed back into the process, helping to defray operational costs. Facilities that do not have these systems or produce too much or too little digester gas use flaring, which converts methane into CO₂ to dispose of the gas. A 2019 NJDEP survey of WWT facilities found additional opportunities existed to increase the beneficial use of produced methane (NJDEP, 2019a).¹⁰

Agricultural Activities

New Jersey’s agriculture sector emissions have remained relatively flat between 2006 and 2022 (Table 5.3). Total emissions for the sector were 0.44 MMT CO₂e in 2022¹¹, representing 0.4% of statewide net emissions. As of 2023, New Jersey’s agricultural sector included 9,998 farms totaling 712,000 acres (USDA, 2024a). Agricultural emissions in New Jersey are proportionally lower than in many other areas of the country because the state’s agricultural sector centers more on crop production than livestock. For example, in 2023 New Jersey ranked among the top five national producers of asparagus, eggplant, tomatoes, spinach, bell peppers and peaches, each of which is familiar to virtually every household in the country (USDA, 2024b). On the other hand, the State raised only 26,000 head of cattle and 6,000 hogs, out of 89 million cattle and 76 million hogs nationally, or 0.03% and 0.008%, respectively (USDA, 2024b).

Table 5.3. Annual Agriculture Greenhouse Gas Emissions 2006 – 2018 (MMT CO₂e). (NJDEP, 2025)

	2005	2006	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
GWP ₁₀₀	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.5	0.4
GWP ₂₀	0.8	0.8	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.7	0.6

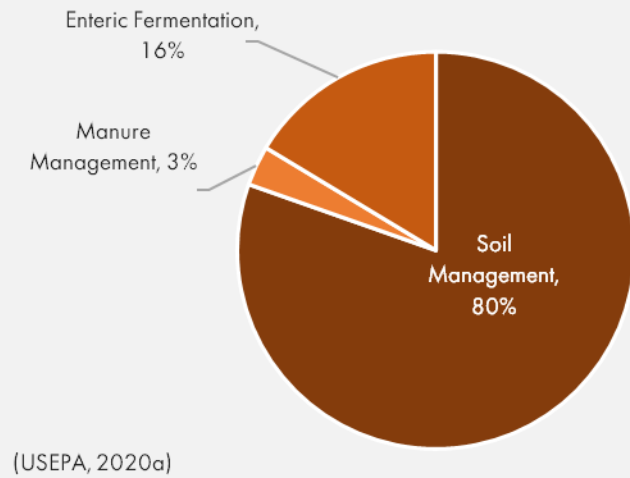
⁹ Emissions estimates are based on the January 2025 release of the USEPA State Inventory Tool, version 2025.1. Reported values may differ from previous estimates because of updates made to the State Inventory Tool.

¹⁰ The survey had a 50% response rate.

¹¹ 0.61 MMT CO₂e based on GWP20.

This is significant because livestock production is a notable source of climate emissions nationally and around the world because of the enteric fermentation that takes place in ruminant animals and the anaerobic decomposition of manure in waste management systems. These processes release methane, and in the case of manure management, nitrous oxide. In 2022, New Jersey's emissions from enteric fermentation accounted for 16% of agricultural sector emissions (Figure 5.3). Soil management practices also contribute to climate emissions from the agriculture sector, for example through conversion of applied nitrogen fertilizer into the climate warming gas nitrous oxide by soil bacteria, or the release of CO₂ following application of lime or synthetic urea. These soil-related emissions are responsible for much of New Jersey's non-fuel agricultural climate emissions, representing 80% of emissions in 2022.¹² Manure management is a much smaller contributor to the state's agriculture emissions, accounting for only 3% in 2022.

Figure 5.3. New Jersey Agriculture Subsector Emissions in 2022 (MMT CO₂e).
Most emissions from the agricultural sector are due to soil management practices.



At both the national and international levels, agricultural climate emissions represent a substantial and challenging area of concern. The need to grow food is universal across the globe, and agricultural emissions arise virtually every place where humans raise food. Further, many of these activities do not lend themselves to simple technological solutions. Instead, innovative approaches to agricultural management will be needed, built on scientific understanding and a willingness to make informed choices outside routine historical norms. Bringing these changes across human civilization, in ways that meet each culture's social and economic needs, will be daunting but must be accomplished.

Waste Business-as-Usual Scenario

The Business-as-Usual scenario (BAU) describes the trajectory of GHG emissions from the waste sector without any policies to drive down emissions. This baseline scenario assumes the following circumstances:

- Population grows at historical rates;
- Waste disposal and wastewater flows increase in proportion to population growth; and
- Existing policies are discontinued.

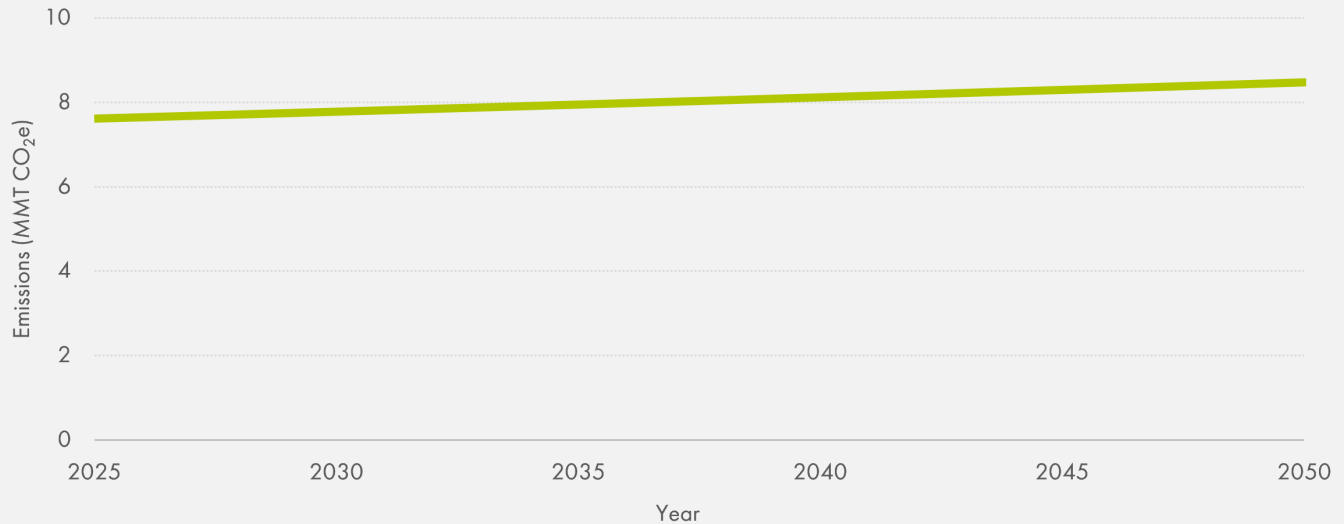
Under this scenario, emissions would increase from 7.5 to 8.5 MMT CO₂e by 2050 (Figure 5.4).¹³

¹² Burning crop residues can also produce small quantities of methane, nitrous oxide, and black carbon (USEPA, 2020b) but are not considered further here.

¹³ Using a 20-year time horizon aka 20-year global warming potential (GWP₂₀), which emphasizes the early impact of these greenhouse gas emissions, the Waste sector emissions would increase from 21.9 to 24.8 MMT CO₂e by 2050.

Figure 5.4. Waste Business-as-Usual Emissions Scenarios, 2020-2050 (MMT CO₂e).

Waste Sector emissions are predicted to rise through 2050 under a Business-As-Usual Scenario to 8.5 MMT CO₂e/year.



Waste Current Policy Scenario

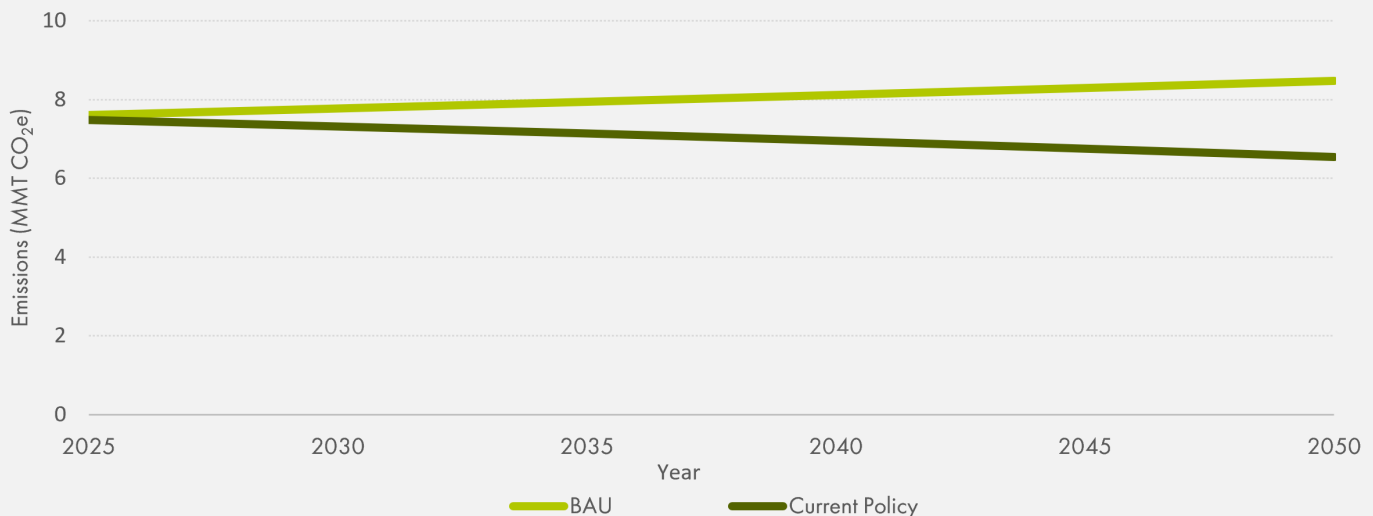
Alternatively, if New Jersey continues to implement its current policies (as described in detail below) the waste sector can achieve a decrease from 7.5 to 6.5 MMT CO₂e by 2050 (Figure 5.5).¹⁴ This Current Policy Scenario assumes the following circumstances:

- A reduction in landfill emissions consistent with Pathway 1 under the NJDEP Global Warming Response Act 80x50 Report (NJDEP, 2019b; NJDEP, 2020).

Specifically, this assumes that New Jersey meets its 50x30 goal, to reduce food waste 50% by 2030, based on a 2017 baseline. Furthermore, it relies on implementation of the 2020 Food Waste Recycling Law. Both laws will require continued efforts to expand food waste diversion opportunities, and markets for recycled food waste and the resulting products.

Figure 5.5. Waste Current Policy and Business-as-Usual Emissions Scenarios, 2020-2050 (MMT CO₂e).

Figure 5.5 shows projected emissions from the waste sector through 2050 comparing Business-As-Usual and Current Policy scenarios, with the Current Policy scenario leading to decreased emissions.



¹⁴ Using a 20-year time horizon (GWP₂₀), which emphasizes the early impact of these greenhouse gas emissions, the Waste sector emissions would increase from 21.9 to 19.0 MMT CO₂e by 2050.

Critical Emissions Reduction Policies Adopted Since 2020¹⁵

New Jersey's existing emissions reduction efforts consist of laws, rules, and policies seeking to reduce the generation and disposal of organic and non-organic wastes. NJDEP regulates efforts to reduce MSW through food waste reduction, and recent mandatory food waste recycling. NJDEP also requires the reporting of emissions from WWT plants, and from all facilities emitting 100 tons of methane per year or more. The New Jersey Board of Public Utilities (NJBPU) regulations incentivize the utilization of biogas produced from wastes for beneficial purposes such as electricity generation through the eligibility of renewable energy credits.

Food Waste Reduction Policies

New Jersey has laws aimed at reducing the amount of food waste being generated and entering the MSW stream. The Food Waste Reduction Act establishes a goal of 50% reduction of food waste generated by 2030 (50x30 goal) and requires the NJDEP to implement a plan to meet this goal. To achieve this goal, the State enacted a suite of policies targeting waste in all parts of the food system. Established in 2022, the Office of the Food Security Advocate (OFSA) was tasked with tackling food insecurity. OFSA, NJDEP and other partners have been working to identify opportunities to rescue food, including participation in the Meal Recovery Coalition – an initiative launched in 2024 and sponsored by New Jersey Economic Development Authority (NJEDA) to combat food insecurity and food waste (Meal Recovery Coalition, 2025).

New Jersey's Food Waste Reduction Plan proposes short and long-term actions that the NJDEP intends to take to achieve the 50x30 goal (NJDEP, 2023). In 2024, NJDEP released an updated set of School Food Waste Guidelines covering K-12 schools and institutions of higher learning (NJDEP, 2024b). Ten Recycling Enhancement Act (REA) grants, totaling approximately 2.2 million dollars, have been awarded to organizations pursuing a range of food waste reduction strategies and technologies. Additionally, NJDEP supported a 2021-2022 waste composition study covering three counties, with the goal of supporting recycling and food waste diversion (NJDEP, 2022).

In 2020, the Food Waste Recycling and Food Waste-to-Energy Production Act (P.L. 2020, c.24) was passed, requiring large food waste generators (who produce 52 tons or more of food waste per year) located within 25 road miles of an Authorized Food Waste Recycling Facility to source separate and recycle their food waste; rules for this law were fully adopted in September 2025. There are two operating Authorized Food Waste Recycling Facilities, with two additional fully permitted facilities under development, one in the permit application process, and one food waste composting facility operating under a Research, Development, and Demonstration permit.

Emissions Reporting

Wastewater treatment facilities and landfills that meet the thresholds of NJDEP's emissions statement rule (N.J.A.C. 7:27-21) must annually report CO₂ and methane emissions. The Greenhouse Gas Monitoring and Reporting Rule (GHGMRR) is an important tool in understanding sources of methane emissions and uncovering opportunities to reduce those emissions. This includes beneficial use of biogas, thus reducing methane emissions even further. Methane reporting rules were revised to require that all facilities with over 100 tons/year of methane report to NJDEP. The first reports covered July 1, 2022 – December 31, 2022; 2023 was the first full reporting year (NJDEP, 2024a).

Waste-to-Energy

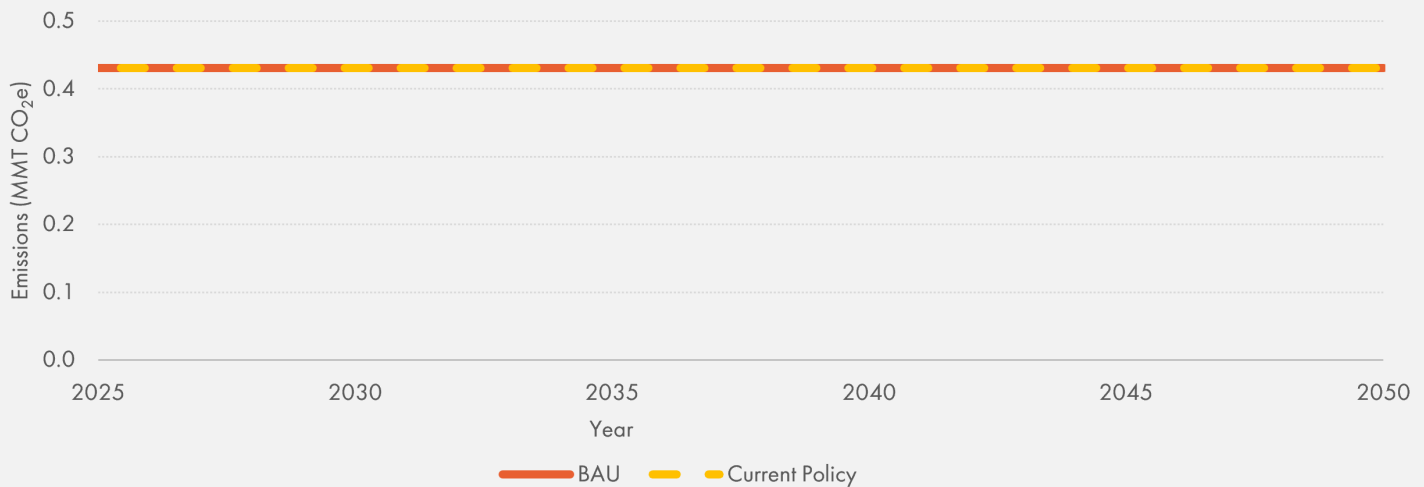
Electricity generated by the combustion of methane gas from landfills, or from the anaerobic digestion of food waste and sewage sludge, qualifies for Class I Renewable Energy Credits under New Jersey's Renewable Portfolio Standards, Food Waste Recycling Facilities can also qualify for these credits. This incentivizes the capture and beneficial usage of methane. NJDEP has been performing studies to identify current WWT facilities with anaerobic digestion that could add food waste to their waste streams, and to explore sites for future anaerobic digesters to treat food waste.

¹⁵ Refer to the 80x50 Global Warming Response Act (GWRA) report for a summary of relevant policies prior to 2020.

Agriculture Business-as-Usual and Current Policy Scenario

New Jersey's agricultural stakeholders and policymakers will play important roles in solving the climate challenge, but few if any policies have realized this potential. Modeling for the 2024 Energy Master Plan concluded that current agriculture policies are inadequate to support achievement of the 80x50 goal, and that the State risks consequences in this sector similar to the no-action, BAU scenario. Under both the BAU Scenario and Current Policy Scenario, emissions remain flat at 0.43 MMT CO_{2e} through 2050 (Figure 5.6).¹⁶

Figure 5.6. Agriculture Business-as-Usual and Current Policy Scenario, 2020-2025 (MMT CO_{2e}).
Projected non-fuel agriculture emissions through 2050, both scenarios result in similar emissions levels.



Critical Emissions Reduction Policies Adopted Since 2020¹⁷

Existing reduction efforts in New Jersey's Non-Fuel Agriculture sector include laws and regulations, as well as outreach, education and support of farming practices that reduce greenhouse gas emissions. Farming and livestock management are regulated by the New Jersey Department of Agriculture (NJDA) through composting and waste management programs; including the Animal Waste Management Rules. There are programs and grants for composting and manure management, and the NJDA has actively pursued federal grants that improve soil conditions while simultaneously reducing emissions (NJDA, 2024). New Jersey has benefited from the United States Department of Agriculture's Climate Smart Commodities program. There are 18 projects that include New Jersey, which cover 99 climate-smart practices (USDA, 2024c).

Animal Waste Management & Composting

The NJDA has rules (N.J.A.C.2:91) for the development and implementation of self-certified Animal Waste Management Plans for farms that generate, handle or receive animal waste. NJDA also offers funds through the Nutrient Management Program to support the use of animal manure on farms (NJDA, 2025). In 2023, NJDA obtained funding through Natural Resource Conservation Service (NRCS) Conservation Innovation Grant (CIG) created a slate of resources to support farmers. This includes the deployment of the NJ Manure Link website, developed in coordination with Rutgers, which connects the generators and users of animal manure. NRCS-CIG funding had also facilitated the implementation of composting trainings, assessment of on-farm composting facilities, and development of a guidance document, detailing on-site construction of manure storage facilities.

As part of best management practices for nutrient management of the soil, NJDA recommends composting of manure, leaves and crop residue. This helps to conserve nutrients produced on the farms and reduces the application of

¹⁶ Using a 20-year time horizon (GWP₂₀), which emphasizes the early impact of these greenhouse gas emissions, the Non-Fuel Agriculture sector emissions would stay constant at 0.6 MMT CO_{2e} through 2050.

¹⁷ Refer to the 80x50 GWRA report for a summary of relevant policies prior to 2020.

commercial fertilizer. NJDA works in partnership with the USDA Natural Resources Conservation Service and the Soil Conservation Districts to provide technical and financial assistance for the installation of conservation practices including cover cropping, contouring and strip cropping, animal waste storage and composting and nutrient management planning. NJDEP also regulates composting, based on type and volume of materials processed (N.J.A.C. 7:26A). NJDEP is currently considering revisions to the outdoor food waste composting provisions of the Recycling Rules to facilitate more composting in the state. A project using USEPA Solid Waste Infrastructure for Recycling grant funds is also underway to develop guidance so that local governments have a roadmap for developing and updating programs.





THE PATH FORWARD

New Jersey's path forward in reducing emissions from waste and agriculture will need to focus on tackling food waste, reducing emissions from landfills and wastewater treatment facilities and adopting climate friendly agriculture practices. The BAU scenario shows that if no action is taken, the emissions from the waste and agriculture sector will increase from current emissions of 6.0 MMT to 8.9 MMT CO₂e by 2050 which is more than 35% of the total 2050 emissions goal of 24.1 MMT CO₂e. Even if current policies continue to be implemented, modeling shows that New Jersey would still fall at least 0.7 MMT CO₂e short of reaching its 2050 sector emissions goal.

The Comprehensive Climate Action Plan (CCAP) Scenario, presented below, found that waste emissions can be reduced to 5.93 MMT (Figure 5.7)¹⁸ and agriculture emissions to 0.40 MMT CO₂e (Figure 5.8) by 2050, which would keep New Jersey on a glide path to meet our overall 2050 GHG goals. In this scenario, the State is assumed to achieve its 50% by 2030 food waste reduction goal and reduce an additional 11% of waste emissions through landfill methane abatement by 2050¹⁹. Additionally, small emission reductions (0.03 MMT CO₂e by 2050) are projected in Non-Fuel Agriculture emissions are assumed to stay constant.

It is important to note that the CCAP Scenario identifies the trajectory of GHG emissions from the waste and agriculture sector necessary to achieve the statewide goal of an 80% emissions reduction by 2050. The measures described below represent one hypothetical way the State can meet its climate emission goals, not the only way. There are many pathways to decarbonization, and it is crucial for New Jersey to continually evaluate its emissions reduction progress and adapt its approach over time.

2050 SECTOR EMISSION GOAL

Waste + Ag Combined

<6.3 MMT CO₂e

EMISSION ACTIVITIES

- Flaring of methane at landfills and WWT facilities, and digester gas
- Disposal of food and other organic waste at landfills
- Application of fertilizers

EMISSIONS REDUCTION MEASURES

1. Adopt stricter rules and incentives for monitoring emissions, landfill caps, and odor controls at landfills and wastewater treatment facilities
2. Expand regulatory requirements and incentives for food waste recycling and diversion
3. Encourage precision agriculture and utilization of compost on cropland and pasture

¹⁸ On a 20-year time horizon CCAP Scenario found that emissions can be reduced from 22.6 to 17.8 MMT CO₂e by 2050

¹⁹ The additional modelled waste emission reductions in the CCAP scenario are due to assuming the state is able to abate landfill methane to the same extent that is described in the EPA's 2019 Non-CO₂ Greenhouse Gas Emission Projections & Marginal Abatement Cost Analysis Report which estimated the potential for landfill methane abatement below \$100/tCO₂e in New Jersey (USEPA 2019).

Figure 5.7. Waste Sector Emissions under the CCAP Scenario.

Projected waste sector emissions through 2050, comparing the Business-As-Usual, Current Policy, and CCAP scenario; the CCAP scenario represents lower emissions than either of the other two scenarios.

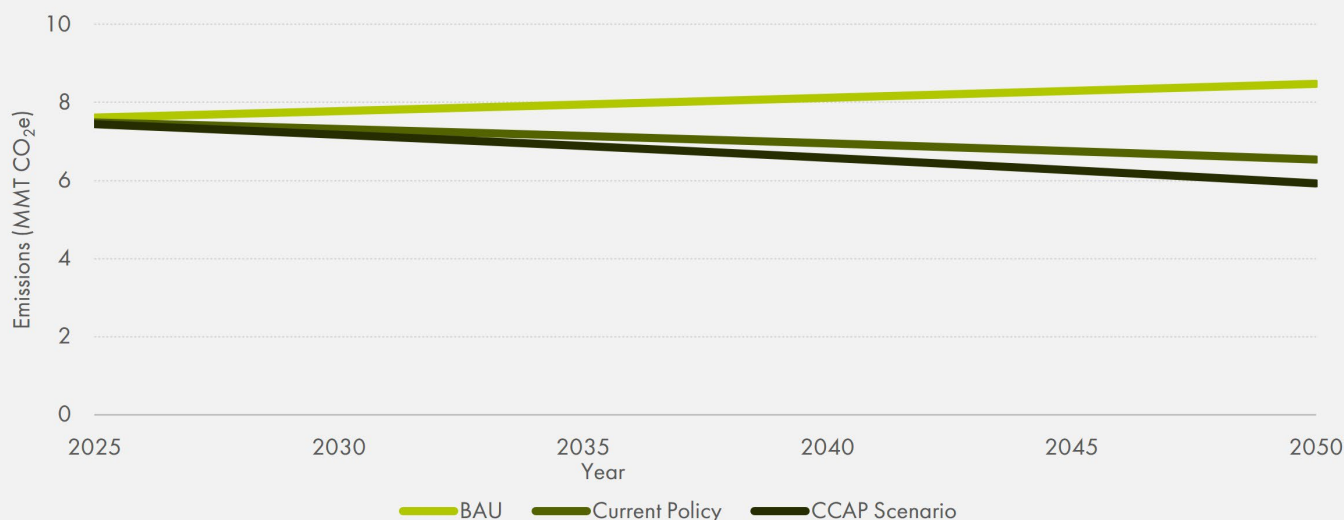
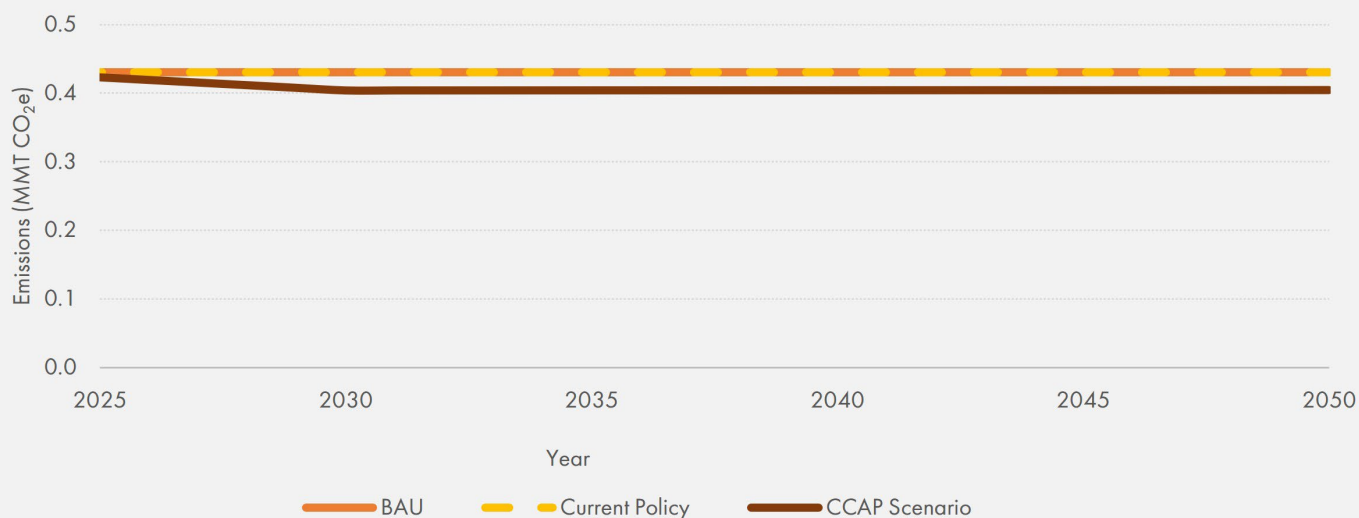


Figure 5.8. Agriculture Sector Emissions under the CCAP Scenario.

Projected non-fuel agriculture emissions under the Business-As-Usual/Current Policy and CCAP scenarios through 2050, the CCAP scenario represents decreased emissions.



The emissions reductions in the Waste and Agriculture sector are unique in that many of them rely on fixes, technologies, and practices that are already developed, and only need broader deployment. There are two measures that will be integral to reducing emissions in Waste. Measure 1 broadly deals with waste that is already in place and continues to generate emissions; whereas Measure 2 is forward looking and provides a way to avoid future emissions.

- **Measure 1:** Adopt stricter rules and incentives for monitoring emissions, landfill caps, and odor controls at landfills and wastewater treatment facilities
- **Measure 2:** Expand regulatory requirements for food waste recycling and diversion

Like Waste, Non-Fuel Agricultural emissions are primarily from methane. NJDEP developed one measure to abate these emissions:

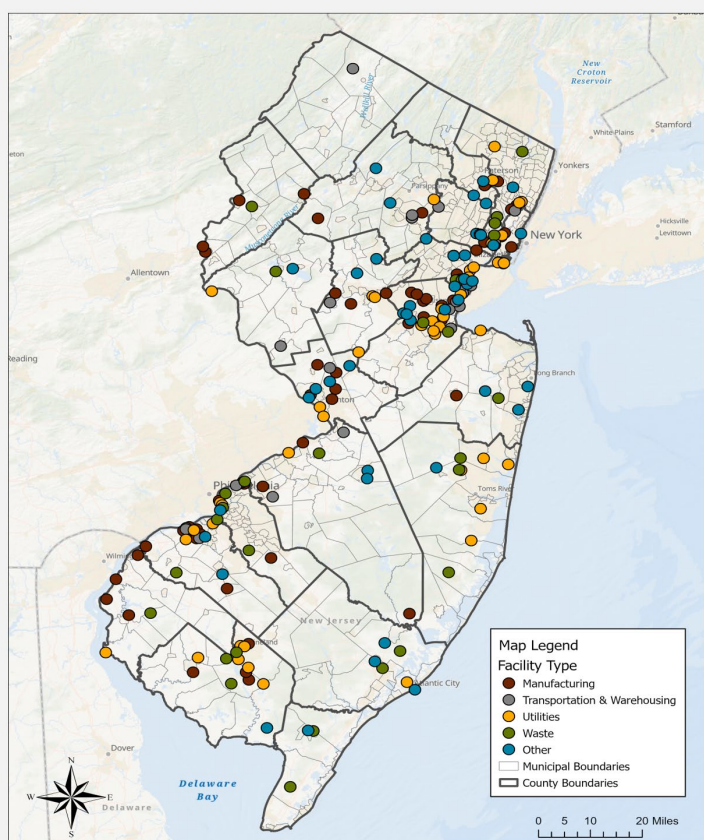
- **Measure 3:** Encourage precision agriculture and utilization of compost on cropland and pasture

Collectively, a combination of policies based on the above three measures can accelerate emissions reductions from the waste and agriculture sectors towards the combined goal of 6.3 MMT CO₂e or less by 2050. NJDEP believes the measures above will likely be needed to affect the levels of waste emission reductions (via food waste reduction and landfill methane abatement) assumed in the CCAP Scenario. Specifically, Measure 1 would help to reduce waste emissions by up to 41.5 MMT CO₂e cumulatively by 2050²⁰; Measure 2 would reduce emissions up to an estimated 11.5 MMT CO₂e cumulatively by 2050²¹, and Measure 3 would reduce emissions up to 2.7 MMT CO₂e cumulatively by 2050. These estimates are based on in-house projections developed by NJDEP, which take into account the two state food waste laws, which are expected to affect a reduction of food waste as well as diversion to anaerobic digesters and composting.

Emissions Reduction Measure 1: Adopt stricter rules and incentives for monitoring emissions, landfill caps, and odor controls at landfills and wastewater treatment facilities

Figure 5.9. Methane Emitting Facilities Reporting under the GHGMRR.

This map shows the location and types of methane-emitting facilities required to report under the GHGMRR throughout New Jersey.



(NJDEP, 2025)

Currently, New Jersey's statutory authority to regulate air emissions at landfills rests primarily on federal regulations.²² The waste already stored in place in landfills and produced by WWT facilities is a continual source of methane emissions that need to be addressed. The State should consider the adoption of lower emissions limits, stricter maintenance and monitoring requirements and prioritization of state of art of methane monitoring and capture technologies. These rules should also prioritize odor minimization. The GHGMRR (N.J.A.C. 7:27E; and amendments to N.J.A.C. 7:27-21) had its first full year of reporting in 2023, and 88% of methane emissions reported under this rule were found to come from the waste sector, with about another 8% coming from utilities (and the remainder coming primarily from transportation, warehousing, and manufacturing) (Figure 5.9).

Precedent exists for stricter state measures, with California, Colorado, Oregon, Maryland, Michigan, and Washington all having rules stricter than federal requirements for landfill methane (CARB, 2025; CDPHE, 2025; COMAR, 2025; Hall & Garland, 2025; MCL, 1994; DEQ, 2021; RCW, 2024). Colorado has taken the national lead on landfill emission regulations, through a new rule passed this year, which incorporates the use of modern methane capture and control measures, as well as remote sensing for emissions monitoring at landfills (CDPHE, 2025). Decreasing costs for aerial monitoring technologies makes these

²⁰ On a 20-year time horizon, this is up to 120.0 MMT CO₂e by 2050.

²¹ Due to data constraints used no 20-year time horizon is given for this figure.

²² Specifically, 40 CFR 60.765(c)(4)(v) which regulates an source above 500 ppm of methane; 40 CFR Part 98 Subpart HH which specifies landfill gas collection efficiencies; 40 CFR 60 Subpart XXX and 40 CFR 62 Subpart OOO which contains MSW landfill performance standards and plan requirements for changes after July 2014, with emissions monitoring requirements; Emissions from fugitive sources and control systems are based on AP-42 Chapter 2 Section 4, using EPA's LandGEM program.

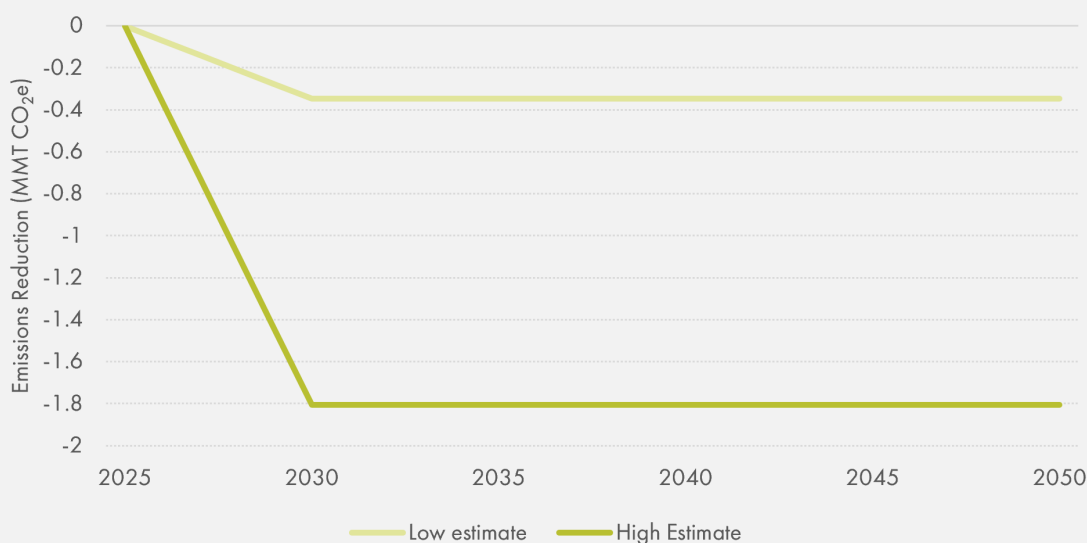
measures even more feasible, with Pennsylvania having recently completed a methane overflight study of various methane-emitting facilities including landfills (PADEP, 2022).

New Jersey should also prioritize offering a range of incentives to help the waste industry evaluate feasibility and encourage implementation of biogas and other energy-producing technologies to help support hard-to-decarbonize industries and increase resilience.

Measure Quantification

The actions described in this measure could reduce emissions by 0.35-1.8 MMT CO₂e annually, resulting in cumulative emissions reductions of 8.0-41.5 MMT CO₂e by 2050²³ (Figure 5.10). These reductions would come primarily from installing and enhancing methane control measures at methane-emitting facilities, landfills (active and closed) and wastewater treatment facilities (WWTFs). It is straightforward to model the scale of reductions based on emissions reported, and potential control devices at known emissions sites. However, some reductions would also come from enhanced monitoring of facilities with diffuse emissions, and targeted statewide emissions monitoring. A recent study suggests that a combination of these technologies can reduce landfill methane emissions by 49.1% or more (Lerner, 2025). It is more challenging to determine the scale of potential reductions from these measures, since aerial monitoring is expected to uncover previously unknown emitters of methane from facilities and locations not currently required to report emissions, such as undocumented former landfill sites. Furthermore, landfill emissions of methane are chemically complex, as biological decomposition occurs over time, and depends highly on weather, climate, and material deposited, all of which have incomplete records. Methane emissions from WWTFs can also vary based on sewerage streams, which can seasonally fluctuate in touristed areas like the New Jersey shore.

Figure 5.10. Annual Emissions Avoided by Measure 1, Adopt Stricter Rules and Incentives for Monitoring Emissions, Landfill Caps and Controls at Landfills and Wastewater Treatment Facilities.
Estimated annual emissions mitigation is shown through 2050 based on Measure 1; assuming implementation begins in 2026 and is fully realized in 2030. High and Low estimates are provided.



Priority Enabling Actions

NJDEP has identified 3 critical enabling actions to support achievement of Measure 1. These involve mitigation measures for known sources of waste emissions – active landfills, WWT facilities, and some closed landfills – as well as enhanced monitoring and reporting to identify unknown sources of waste-sector emissions, primarily closed landfills.

Enabling Action 1.1 *Modify landfill monitoring and reporting regulations to include lower reporting thresholds for methane emitting facilities and adopt modern monitoring technologies at landfills and WWTFs*

²³ On a 20-year GWP time horizon, this would be 1.0-5.2 MMT CO₂e annually, or 23.3-120.0 MMT CO₂e cumulatively by 2050.

Currently, most landfill methane air quality control in New Jersey is enforcement of federal rules and laws. Specifically, 40 CFR 60 Subpart XXX requires monitoring sites emitting methane on a quarterly basis, and new collection devices to be installed if a facility equals or exceeds a reading of 500 parts per million (ppm) per 40 CFR 60.765(c)(4)(v). This aids in monitoring and mitigating fugitive emissions from New Jersey's landfills, and the GHGMRR provides for monitoring of sources that produce 100 tons or more per year of methane, but more can be done to identify and monitor sources of methane, including active and closed landfills.

Other states have adopted rules and regulations stricter than federal regulations for landfill methane monitoring. California and Washington State require landfills with a gas heat input capacity greater than or equal to 3 million BTUs an hour (MMBtu/hour)²⁴ to monitor quarterly for a year for readings above 200 parts per million by volume (ppmv) or install gas collection and control systems (GCCS) (CARB, 2025; Washington State Department of Ecology, 2024). It is estimated that such a regulation in New Jersey would include all of State's 12 active landfills, and some of the larger closed landfills. Maryland and Oregon have similar landfill methane regulations, wherein landfills generating over 8,548 tons/year of methane must install GCCS, and those between 732-8,548 tons/year must either install GCCS or perform surface monitoring (COMAR, 2025; DEQ, 2021). California, Colorado, Maryland, Oregon, and Washington are also phasing out open flaring in favor of enclosed flaring of landfill methane. Colorado has similar regulations to Maryland and Oregon, but the cutoff is 2,000 tons/year instead of 8,548 tons/year. Colorado has also enacted the country's strictest monitoring guidelines using aerial platforms and mandatory early collection devices in active disposal areas (CDPHE, 2025).

New Jersey could pursue the adoption of similar regulations for monitoring, including lowering thresholds for monitoring, lowering thresholds for installing GCCS, and more frequent monitoring using aerial methane monitoring technologies. One of the main issues in this sector is that there are many fugitive and diffuse emissions coming from landfills. Requiring more frequent monitoring – monthly instead of quarterly, or even continuously at large emitters – would enhance the visibility of methane emissions and allow the state to act on those emissions.

Aerial monitoring, including drones, has become cheaper, as demonstrated by Pennsylvania's pilot study (PADEP, 2022; Hall & Garland, 2025), and other work in the sector – including platforms such as MethaneSat, TROPOMI and NearMap. WWTFs are also a significant source of methane emissions. While these are largely controlled, it is not always easy to tell where there may be sources or leaks. Thus, enhanced monitoring of WWTFs would also help to identify room for improvement at these facilities. Notifying methane sources of emissions in a timely manner, and targeted enforcement will lead to more reductions in methane emissions. This is especially true of diffuse sources like landfills where the emissions often come from diffuse areas like the working face (the portion of the landfill where material is being actively deposited) as opposed to a smokestack, pipe, or other obvious outflow source (Scarpelli, et al., 2024).

Enabling Action 1.2 *Evaluate adopting new control requirements on methane emissions*

As stated above, several states have adopted requirements for landfills including stricter requirements for GCCS in landfills – specifically California, Colorado, Maryland, Oregon, and Washington (CARB, 2025; CDPHE, 2025; COMAR, 2025; DEQ, 2021; RCW, 2024; Washington State Department of Ecology, 2024). These regulations largely require new GCCS or monitoring after exceedances in methane readings. By adopting these control measures, New Jersey could capture more of the methane emitted by landfills. Furthermore, requiring enclosed flares would also reduce methane emissions, compared to the current open flaring at some sites. Following Colorado's lead in requiring early collection of methane would also decrease emissions in a meaningful way. Recent studies suggest that up to 79% of landfill emissions come from working faces (Scarpelli, et al., 2024), that could be mitigated by early collection.

NJDEP should evaluate its existing air quality and waste permitting regulations to enhance collection and improve controls of methane emissions from landfills and wastewater treatment facilities. Stepping up the existing standards will help to lower emissions and address maintenance issues (like erosion) that create new leaks. Additionally, creating incentives for landfills and WWTFs that help them to invest in control devices would provide a reason for these facilities

²⁴ CARB provides a Landfill Gas Tool to assist landfill owners and operators in compliance <https://ww2.arb.ca.gov/resources/documents/carbs-landfill-gas-tool>

to proactively work to contain on-site leaks. Other efforts could include encouraging the use of compost on top of closed landfills, which can serve as a relatively cheap way to reduce methane emissions at closed landfill sites (Sardarmehni, Levis, & Barlaz, 2020).²⁵ Updating the air quality and waste permitting to enhance existing control measure requirements would lead to additional reductions. Since many of these facilities are already located in Overburdened Communities, enhancing control measure requirements would also contribute to community well-being in locales historically burdened with pollution.

Enabling Action 1.3 *Encourage and incentivize waste facilities to increase on-site dewatering*

The State should consider creating incentives for waste facilities to dewater residuals. Residuals from WWT facilities are a significant source of methane emissions. Residuals are composed of organic residue removed from wastewater during sewerage and wastewater treatment²⁶. Landfilling of residuals is banned in New Jersey. Typically, residuals are transported with a water content in excess of 85% or even 90%, from local/municipal facilities to larger WWTFs. About 20% of sludge in New Jersey is used as daily cover at landfills and another 40% is used in similar ways out of state; 7% is disposed of out of state at landfills; 9% is used for compost and pellets; and 22% is incinerated.

Methane captured and controlled at WWTFs can reduce emissions in two ways. In addition to capturing and controlling the methane on-site, it can also be used beneficially for dewatering, which lowers emissions from transporting sludge. Biogas, combined heat and power, and other onsite efficiency strategies at WWT facilities to dewater residuals would lower the amount of waste from WWT facilities sent to landfills, and thus lower landfill emissions. It would also decrease the emissions from transporting residual material by requiring fewer trucks, train cars, and barges for transportation to larger WWTFs and (out of state) landfills. There are a limited number of large sewerage facilities, meaning that many loads of waste are transported in excess of 25, 50 or even 100 miles. Doubling the concentration of biosolids from 10% to 20% would, in effect, halve the truck loads of residuals to be transported. The trucks used for transportation are mostly large, heavy-duty vehicles, and this one action could cut the pollution from these vehicles in half and still transport the same amount of waste. The pollution benefits would also include reductions in black carbon. See the Highly Warming Climate Pollutants chapter, Black Carbon section.

The technology required for methane capture and use at WWTFs exists and is available. A major remaining barrier to wider adoption is the upfront cost. By providing grants, loans, incentives, feasibility studies, and other funding support, the State could help WWTFs to more broadly adopt a wider range of site-appropriate methane control and beneficial use technologies.

Table 5.4. Measure 1 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Modify Landfill monitoring and reporting regulations to include lower reporting thresholds for methane emitting facilities and adopt modern monitoring technologies at landfills and WWTFs	Mid Term	NJDEP, NJ Legislature, Waste Authorities
Evaluate adopting new control requirements on methane emissions	Ongoing	NJDEP, NJ Legislature, Waste Authorities
Encourage and incentivize waste facilities to increase on-site dewatering	Ongoing	NJDEP, Sewerage Authorities, NJEDA, NJ Green Bank

Table 5.5. Measure 1 Implementation Approach.

Plan to Leverage Funds

²⁵ Research on this topic is still relatively recent. Reductions at a specific site will rely on the compost used, as well as the medium it is replacing; additionally, climate, weather, composition of landfilled material, and site characteristics like drainage all have a huge impact on emissions reductions potential. The cited study found that in 77% of cases modeled, compost reduced global warming potential 63% of the time when used as a portion of Alternative Daily Cover (ADC) in landfills. More research is needed to accurately gauge the impact that compost could have in reducing landfills emissions when used as a portion of ADC since these are complex biological systems.

²⁶ “Sludge” and “biosolids” are technically specific types of residuals, though the terms are often used interchangeably, and will be used interchangeably here.

Cost of Measure

Medium

Secured Funding

The State Revolving Fund can be used for infrastructure improvement at wastewater facilities. The New Jersey Water Bank may also be able to provide funds for improvements at WWT facilities. The Water Infrastructure Investment Plan is implemented by the NJ Water Bank to efficiently spend and allocate funds provided through the Bipartisan Infrastructure Law, and American Rescue Plan Act for water improvements in the State (NJDEP, 2024c) (NJDEP, 2025).

Funding gaps + opportunities

All enabling actions in this measure would benefit from additional funds. More funding would allow New Jersey to implement these changes more rapidly, thus lowering emissions and improving human and environmental health more quickly, which is especially vital for methane emissions. Costs for additional monitoring performed by NJDEP and compliance enhancement may be offset by increased revenues from violation enforcement. Funds could be dedicated to both incentives for upgrades to WWT facility infrastructure and monitoring/compliance implementation.

Partnerships with neighboring states and existing non-profits could bring down costs, for example, by scheduling flyovers that cover New Jersey as well as Delaware. Multistate organizations that could provide a platform for collaboration include: NESCAUM, the US Climate Alliance. Potential non-profit collaborators include MethaneSAT, and Carbon Mapper. New Jersey currently contracts with NearMap which provides aerial imagery, and Esri²⁷ which provides remote sensing software. Both of these could be leveraged and expanded to further support and enhancement air-based platforms for monitoring methane and supporting tools for enhanced compliance and enforcement.

Some funding for WWT facilities is available through programs including the NJ Water Bank, NJ Green Bank, and the Water Infrastructure Investment Plan (NJDEP, 2024c; NJGB, 2025). However, these programs are often only limited to public sewerage entities, and there are limits to the types of work that can be performed with these funds. Since sewerage rates are tightly regulated, it is often difficult for sewerage facilities to raise funds for capital improvements, or even to fund the investigation into improvements. Funding specifically allocating towards feasibility studies for WWT facilities to enhance dewatering capacity and beneficial use of biogas available to all WWT facilities would increase the capacity for these activities and thus lower the resulting GHG emissions across all of New Jersey.

Geographic Scope

Statewide

Authority to Implement

Subject to further legal review:

NJDEP has existing statutory and regulatory authority to require facilities to monitor methane emissions. Additionally, NJDEP has a delegation agreement with US EPA to monitor MSW landfill emissions. However, it would require a change in legislation to lower the reporting threshold for methane emissions, require additional methane control measures, or to impose additional fines or penalties on facilities that have the potential to emit less than 100 tons per year. NJDEP may approve funds for enhancements of leak detection, beneficial use, and monitoring at sewerage authorities under the Water Infrastructure Investment Plan, NJ Water Bank, and other grant and loan programs that sewerage authorities apply for.

Metrics for Tracking Progress

New Jersey's GHGMRR requires the reporting of methane emissions from sources emitting 100 tons per year or more. This can easily be tracked on a year-to-year basis and monitor emissions reductions.

Installations of new GCCS, flares, and other control systems can also be tracked, and how many of these are the result of emissions limits violations.

Progress of rules and legislative revisions to lower the reporting threshold and enhance noncompliance penalties and fines can be tracked.

NJDEP's water program monitors the landfilling of sludge from sewerage facilities. This can be tracked year by year, including information on water content of sludge.

Ground- and air-based remote sensing platforms will provide a powerful tool for tracking statewide emissions. Continuous or regular monitoring of major methane sources will allow for tracking of emissions reductions. Furthermore, regular statewide monitoring will allow for the detection of new and unknown sources, or previously unreported leaks or events.

²⁷ Links to all potential partner organizations mentioned: <https://www-f.nescaum.org/about-us>, <https://usclimatealliance.org/>, <https://www.methanesat.org/>, <https://carbonmapper.org/>, <https://www.nearmap.com/>, <https://www.esri.com/en-us/home>

Reductions in landfilled biosolids from WWT facilities can be tracked, as well as reductions in methane emissions from WWT facilities. Numbers of newly installed control devices, engines, and other beneficial use operations will also be tracked through this program. The WIP already requires reporting.

Incentives for WWT facilities, as well as landfill methane control devices will be tracked in dollars, allowing for the calculation of dollars per metric ton of reduction.

Emissions Reduction Measure 2: Expand regulatory requirements and incentives for food waste recycling and diversion



Figure 5.11 EPA's Wasted Food Scale

EPA's wasted food scale shows a hierarchy of food waste diversions strategies from most to least preferred.

(Source: USEPA 2023)

Achieving a 50% reduction in food waste by 2030 will require residents, businesses, and other entities to generate less food waste as well as require the expansion of a food waste recycling industry and recovery operations in New Jersey. Achievement of this goal is critical to realizing the emission reductions associated with the current policy emissions reduction scenario. However, the state will need to go a step further and achieve deeper emissions reductions necessary for attaining the CCAP Scenario. To reach the 80x50 goal, the State will need to expand its regulatory requirements for food waste recycling and diversion in addition to drawing more large food waste generators under regulatory requirements, and expanding statewide food waste separation, rescue and diversion.

Measure Quantification

Using EPA's Excess Food Opportunities Map, there are over 27,000 facilities in New Jersey producing food that could be rescued (USEPA, 2025b). This map gives high and low estimates of how much food waste is produced; however approximately 1,100 facilities produce 52 tons/year or greater of food waste, whereas 1,400-3,900 are estimated to produce 25 tons/year or more of food waste. If this measure is

implemented as proposed, more facilities will be required to reduce or divert food waste under the law. Estimates are that 475-1,122 facilities are subject to the current law that produce a total of 312,000-1,002,000 tons/year of food waste. If the law was expanded to facilities producing 25 tons/year or more of food waste within 50 road miles of an Authorized Food Waste Recycler, 1,443-3,904 facilities would be subject to the law, producing a total of 428,000-1,392,000 tons/year of food waste. NJDEP assumed that reductions in waste would be evenly split among reduction (food eaten or not produced), diversion to composting, and diversion to anaerobic digestion. Under this framework, expansion of the law would result in additional emissions reductions of 0.1-0.5 MMT CO₂e annually (Figure 5.12), or cumulative reductions of 3.4-11.5 MMT CO₂e by 2050²⁸ (Figure 5.13).

²⁸ Figures for this estimation are not available in GWP20 due to data constraints.

Figure 5.12. Annual emissions avoided by Measure 2, Expand regulatory requirement and incentives for food waste recycling and diversion.

Annual Reductions estimates from 2025-2050, assuming implementation begins in 2026 and is fully realized by 2030. These reductions are in addition to emissions reductions from current policies.

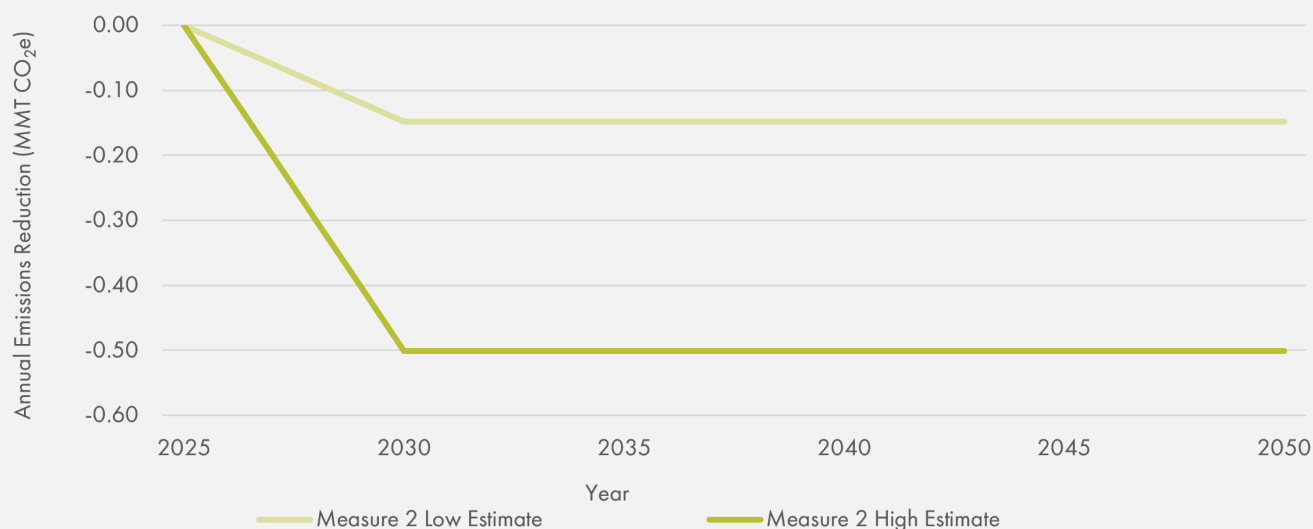
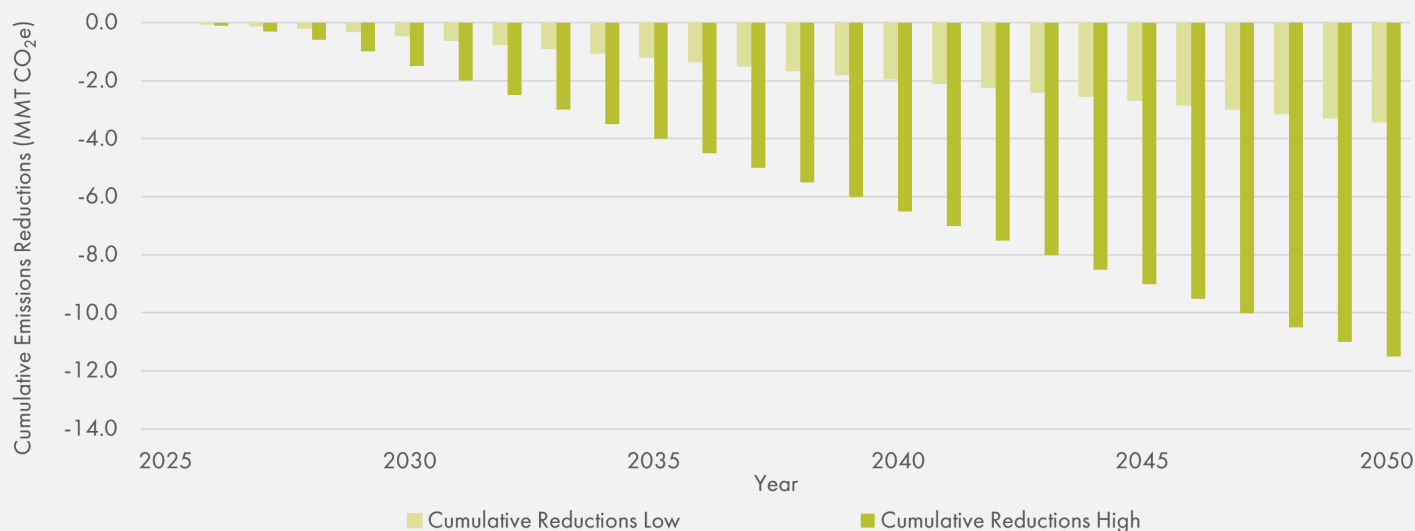


Figure 5.13. Cumulative emissions avoided by Measure 2, Expand regulatory requirement and incentives for food waste recycling and diversion

Cumulative Reductions estimates from 2025-2050, assuming implementation begins in 2026 and is fully realized by 2030. These reductions are in addition to emissions reductions from current policies.



Priority Enabling Actions

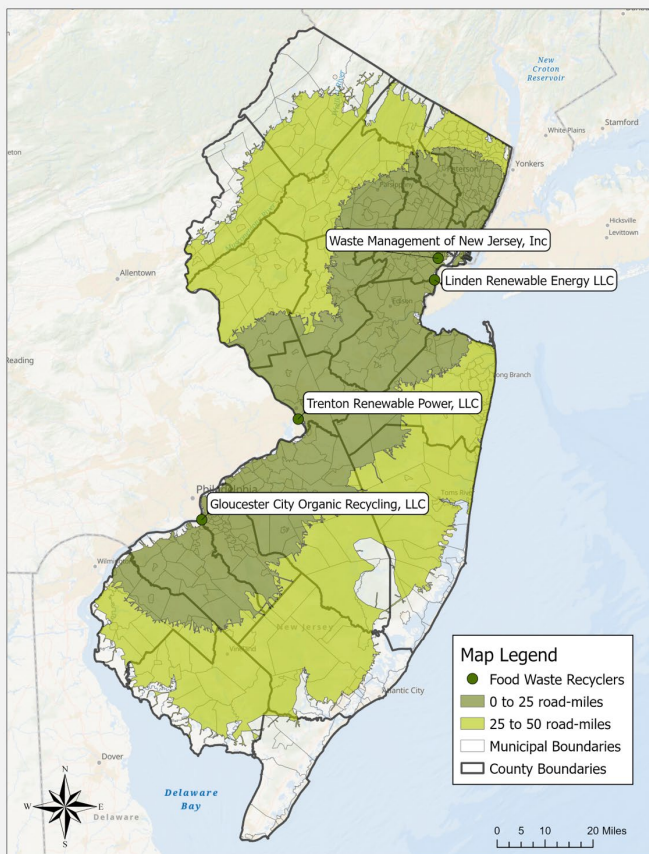
To successfully reduce emissions from the waste sector, food waste will need to be addressed. New Jersey has laws dealing with a portion of the food waste stream, however, fully realizing the potential emissions reductions available in this sector will require a concerted effort. Policy and regulatory updates, progress tracking measures, expansion of food waste recovery and diversion, and support for food waste recovery systems will help the state to maximize emissions reductions in this sector, as laid out by the six enabling actions detailed below.

Enabling Action 2.1 Amend the Food Waste Recycling and Food Waste-to-Energy Production Law

The 2020 Food Waste Recycling and Food Waste-to-Energy Production Law (N.J.S.A. 13:1E-99.122) requires certain large food waste producers²⁹ who generate 52 tons or more of food waste per year and that are located within 25 road miles of an Authorized Food Waste Recycling Facility to source separate and recycle their food waste. Rules for the Food Waste Recycling Law are published and fully adopted, with the first full year of required reporting anticipated to be 2026. Over the coming years, if new food waste recycling facilities do not come online in other parts of the state, the NJDEP should consider amending the law to expand the radius of required food waste recycling from 25 road miles to 50 miles. This would expand the regulatory requirement to cover a much larger portion of NJ and thereby divert more food waste. The NJDEP could also consider lowering the threshold for required recycling from 52 tons to 25 tons per year to capture a larger portion of food waste generators.

Figure 5.14. Fully Permitted Authorized Food Waste Recyclers with 25 and 50 Road-Mile Radii.

Figure 5.14 shows the expansion of areas covered by the Food Waste Recycling Law under the current 25 road-mile radius, and additional areas that would be covered with a 50-road-mile-radius.



(NJDEP, 2025)

New Jersey currently has two Authorized Food Waste Recycling facilities, and one composting facility that accepts food waste under a Research permit. Collectively, these facilities cover most of the I-95 corridor, which overlaps with the most populous parts of the State. Two other food waste recycling facilities have been fully permitted, and one more is in the application process. Figure 5.14 shows the two currently operating Authorized Food Waste Recyclers and the two fully permitted facilities, with 25 and 50 road-mile radii around all four. Expanding the radius from 25 to 50 miles would bring a much larger portion of the State into required recycling under the law. All three are expected to open soon, which will give NJ six facilities authorized to accept and recycle food waste, five of which would be considered Authorized Food Waste Recycling Facilities under the Food Waste Recycling and Food Waste-to-Energy Production Law. The map on the left (Figure 5.14) depicts the two operational Authorized Food Waste Recyclers as well as the two permitted facilities. As can be seen, expanding the distance of obligatory food waste recycling from 25 to 50 road miles would bring in a much larger portion of the State. The addition of these facilities will provide more capacity and greater coverage of the State.

Enabling Action 2.2 Require district solid waste management plans to prioritize food waste reduction and source separation of organic material

²⁹ Examples of large food waste generators include industrial food processors, supermarkets, conference centers, restaurants, educational institutions, military establishments, prisons, hospitals, and casinos.

New Jersey's solid waste management is primarily handled through district³⁰ Solid Waste Management Plans that aim to reduce disposal by promoting reuse, recycling, and composting. The State should initiate education and outreach efforts to reduce food waste and promote source separation by making sure that all district solid waste management plans adequately address these concerns including residential food waste. The Recycling Enhancement Act County Grant program provides funding for counties to prepare, revise and implement district solid waste management plans. The NJDEP could require that any recipient of the grant funds also revises their plans to include food waste reduction actions and steps to implement source separation of organic materials. Beyond that, New Jersey could also pursue legislating that all districts include food waste reduction and source separation of organic materials in their plans. A timeline that allows for a phase-in as food waste diversion outlets expanded may be necessary to ensure maximum success. Requiring source separation would entail action from the New Jersey legislature and would likely need to include guidance and technical assistance from NJDEP to assist districts. Regardless, districts will need to establish a robust system for source-separation of organic materials in order for NJ to implement the Food Waste Recycling Law.

Mandating source separation of organic material would serve several purposes in lowering waste-related emissions. For one, it would keep food and other organics out of landfills, where their decay is the major source of methane emissions. Second, stakeholders in the waste and food diversion industry have cited uncertainty as a major barrier to investing in new and upgraded facilities. If food waste and organic material separation and diversion were mandated in district solid waste management plans, actors in the waste industry would be less hesitant to invest in food waste recycling. Furthermore, mandating separation of food waste and organics would be a major step in NJ's goal of reducing food waste 50% by 2030. Emissions reductions depend on the destination of food waste. One short ton of food waste prevented saves about 0.84 MTCO₂e, whereas diversion to composting or anaerobic digestion results in less of an emissions reduction (USEPA, 2023). New Jersey could look to New York City, which has recently mandated the separation of compostable material, for a path to follow (NYCDS, 2025). While New York City is more compact than New Jersey, it is home to roughly the same number of people. New Jersey has more possible outlets for compost, and could start small by piloting programs in urban, rural and suburban areas to build programs that address the unique needs of New Jersey's communities.

Enabling Action 2.3 *Support food waste recovery systems such as anaerobic digesters and co-digestion of food waste at wastewater treatment facilities*

Anaerobic digestion and co-digestion are acceptable pathways for food waste recycling and diversion under the Food Waste Recycling and Food Waste-to Energy Production Law. There are 40 WWT facilities with anaerobic digesters in the State. Adapting these facilities to include food waste products would lower the amount of food waste landfilled (as outlined in Measure 1). Additionally, co-location would be cheaper than building wholly new food waste recycling facilities. It would also provide opportunities to produce biogas which can be used for dewatering sludge, powering hard-to-decarbonize industries, local microgrids for resilience during storms and outages and to provide clean, firm power to the electric grid. Funding feasibility studies and expanding the beneficial use of biogas at WWT facilities and landfills would support these developments. These funds could come from programs like the NJ Water Bank and could assist facilities in installing or upgrading existing biogas systems. A NJDEP Science Advisory Board report estimates that the State could realistically produce 1 TWh/year of biofuel from these sources by 2050 (NJDEP Science Advisory Board, 2023). Primary sources of this biofuel would be biogas from wastewater treatment facilities, landfills, and other avenues of waste disposition including anaerobic digestion of food waste and other organic matter. The availability of Class I Renewable Energy Credits also incentivizes installation of anaerobic digesters where applicable. NJDEP should create guidelines to assist in siting and permitting such facilities to support the goals of the Food Waste Recycling Law (P.L. 2020, Chapter 24).

³⁰ Most districts are counties, however there is also the Hackensack Meadowlands District which is not a county. The terms "district" and "county" are often used interchangeably when referring to Solid Waste Management Plans.

Enabling Action 2.4 *Implement regular statewide waste composition audits to track progress towards the goals of the Food Waste Reduction Act*

The 2017 Food Waste Reduction Act established a goal of reducing food waste 50% by 2030. To understand if progress is being made towards this goal, comprehensive waste composition audits of municipal solid waste streams must occur on a regular basis. Otherwise, it cannot be known if food waste is being reduced, and if waste reduction measures are effective. Statewide waste composition audits would also help to identify areas of leakage- food waste that is not being reduced, recycled, or diverted. Comprehensive audits implemented by NJDEP would help to identify geographic areas where measures are notably successful or unsuccessful. They would also help to identify entities that should be registered as Large Food Waste Generators but are not reporting and not recycling their waste as required by law. A waste characterization study carried out in 2021-2022 covered three counties in 2021-2022 and published in 2022. Future audits will help the State to recognize barriers to food waste reduction (NJDEP, 2022).

Enabling Action 2.5 *Continue to pursue revisions to the Recycling Rules (N.J.A.C. 7:26A)*

NJDEP is in the process of stakeholdering changes to the recycling rules, which include composting regulations. An information session was held in August 2024, with stakeholder meetings anticipated for winter 2025-2026. Revising recycling and composting rules would make it easier to expand the market for food waste recycling and make it easier for food waste to be diverted from landfilling and composted. Composting food waste results in an emissions reduction of 0.15 metric tons CO₂e (MTCO₂e) per ton of food waste on a lifecycle basis, due to offsets of fertilizer and soil carbon sequestration. Contrast this with lifecycle emissions of 0.5 MTCO₂e of emissions from landfilling food waste. Thus, composting results in a total of 0.65 MTCO₂e net emissions reduction per ton of food waste when compared to landfilling (USEPA, 2023).³¹ There is currently one composting facility that accepts food waste under a Research, Development, and Demonstration permit. Making it easier for composting facilities to open and accept food waste would make voluntary diversion and composting of food waste easier and thus more likely to occur.

Enabling Action 2.6. *Expand State support for initiatives that encourage food waste prevention, recovery and distribute edible food before it is wasted*

As described in USEPA's Waste Food Scale, the best way to reduce food waste and reduce associated emissions is to prevent food waste. This is closely followed by making sure that edible food is eaten or upcycled, and consumed by humans, or, if not, by other animals. There are many related actions the State can take to support these activities. In collaboration with rescue organizations, soup kitchens, food banks, and other stakeholders, the State can help to provide funds for food refrigeration, platforms to match food donors with recipients, and legal frameworks to reduce liability to donors in good faith donations. These activities reduce emissions, save money, and help to feed hungry people. Additionally, many of these activities are lower cost than landfilling, composting, or digestion processes.

Table 5.6. Measure 2 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Amend the Food Waste Recycling and Food Waste-to-Energy Production Law	Near Term	NJDEP
Require district solid waste management plans to prioritize food waste reduction and source separation of organic material	Near Term	NJ Legislature, NJDEP, County/district waste authorities, Local government
Support food waste recovery systems such as anaerobic digesters and co-digestion of food waste at wastewater treatment facilities	Near Term	NJDEP, EDA, Green Bank, Local Government, Sewerage Authorities
Implement regular statewide waste composition audits to track progress towards the goals of the Food Waste Reduction Act	Near Term and Ongoing/ Every 3 years	NJDEP, REA recipients, County waste authorities

³¹ These figures are from US EPA's WARM model documentation and include offsets from soil carbon storage and avoided fertilizer use, as well as transportation and machinery emissions (for both composting and landfilling).

Continue to pursue revisions to the Recycling Rules (N.J.A.C. 7:26A)	Ongoing	NJDEP
Expand State support for initiatives that encourage food waste prevention, recover and distribute edible food before it is wasted	Ongoing	OFSA, NJDEP, local government and non-profit partners

Table 5.7. Measure 2 Implementation Approach.

Plan to Leverage Funds
Cost of Measure Medium
Secured Funding The State has secured \$491,314 in Solid Waste Infrastructure for Recycling (SWIFR) Grants to support the development of food waste planning guidance and a toolkit for local governments that wish to establish or update food waste management programs and a food waste estimation tool that supports business compliance with the Food Waste Recycling and Food Waste-to-Energy Production Law and provides businesses with the opportunity to assess food waste generation to implement strategies for managing food waste. As of publication of this plan, NJDEP is working with its selected subcontractor to complete the work under this grant. NJDEP will continue to dedicate Recycling Enhancement Act grants (REA) funds for a range of food waste projects including recycling programs, best practices development, environmental education campaigns for schools, food asset mapping, and higher education cooperative extension projects. In 2021-2022, the Rutgers EcoComplex conducted a waste audit across 3 counties under the REA Grants for Institutions of Higher Education (NJDEP, 2022). Future funds for expanded or repeated waste audits may be available. The State Revolving Fund can be used for infrastructure improvement at wastewater treatment facilities related to anaerobic digestion. Non-profits and educational institutions have carried out work on an ongoing basis.
Funding gaps + opportunities All enabling actions described in this measure would benefit from additional funds. More funds would allow New Jersey to expand and implement these efforts more quickly and on a wider scale, achieving deeper decarbonization. Rapid methane reductions can lead to fast results, due to methane's shorter life in the atmosphere relative to carbon dioxide. Funding is also needed to sustain educational efforts, develop impactful interventions and to embed work in local governments and regional organizations. Specifically, many WWT facilities lack the funding to invest in large projects to add or enhance on-site anaerobic digesters. Furthermore, with an unknown amount of food waste, there is less of an impetus to do so. By expanding food waste reduction regulations – by lowering the threshold for food waste generators, requiring source separation, and expanding road mile coverage to 50 miles – there would be a larger built-in market for food waste diversion. Additionally, requiring more source separation of food waste, and making food waste recycling laws more inclusive would require additional staffing and facilities for food waste collection, recycling, sorting and diversion. Existing funding opportunities that could be leveraged to expand and continue these programs include: • Local Foods, Local Places • SWIFR Grants • USEPA Recycling, Education and Outreach Grant • USDA Composting and Food Waste Reduction for local governments • USDA Rural Energy for America Program Renewable Energy Systems & Energy Efficiency Improvement Guaranteed Loans & Grants New Jersey will continue to monitor federal funding opportunities to support all these efforts.
Geographic Scope Statewide
Authority to Implement Subject to further legal review: NJDEP has existing authority to support policy and programming and take actions to encourage and support programs and projects for sustainable food management, including food waste reduction and recovery and composting, as well as for wastewater treatment facilities. NJDEP also has authority to

promulgate rules pertaining to food waste and recycling. See, e.g., N.J.S.A. 13:1E-1 et seq., 13:1E-99.11 et seq., 13:1E-99.122 et seq., and 58:10A-1 et seq. NJDA and local governments similarly have authority to implement supporting and educational projects. County governments have existing authority to update district solid waste management plans, and local governments have planning authority to implement supporting projects. Local school boards have the authority to support adoption of food waste reduction measures. Legislation would be required to amend the Food Waste Recycling and Food Waste-to-Energy Production Law; likewise, requiring district management plans to include source separation food waste would require legislative amendments.

Metrics for Tracking Progress

Food waste audits of New Jersey's waste stream will allow for the quantification of food waste reductions, gauge the effectiveness of particular programs, and make adjustments as necessary. The 2021-2022 Waste audit will serve as a comparison point for future audits. Repeated audits on a three-year cycle would be appropriate for tracking progress.

Progress of rule revisions for the food waste recycling law, food waste reduction act, and revisions to the Recycling Rules and district waste management plans.

The number of food waste recycling facilities and their throughput of food waste will be a useful metric. This can include food waste utilized in anaerobic digestion, as well as the resulting reduction in natural gas use when substituted by biogas. Likewise, tracking the number of new composting sites and their composting generation will also provide useful metrics. Acceptance of food waste at wastewater treatment facilities will also be tracked. DEP performed an internal study in spring 2025 to locate existing anaerobic digesters and highlight potential future sites for anaerobic digesters.

If an application or other platform is created or adopted, this will allow for the tracking of food waste donors and recipients, and the amount of food diverted. It may also support the tracking of toolkit measures in use by towns and schools. Towns interested in reusable food-waste programs have proposed quantification schemes for tracking participation by the food services industry.

Emissions Reduction Measure 3: Encourage precision agriculture and utilization of compost on cropland and pasture

Utilizing sound soil conservation and nutrient management practices is important to reducing emissions and improving soil health. Under this measure, promoting better soil management through incentives for crop rotation practices, cover cropping, and no-till practices have been identified as strategies that reduce GHG emissions and increase soil carbon sequestration (Fargione, 2018). Nitrogen fertilizers and other soil amendments constitute 80% of non-fuel agriculture emissions (USEPA, 2020a). Substituting some or all of these amendments, when possible, with locally produced compost would lead to lower emissions.

Improving the quantity and timing of applications, switching from anhydrous ammonia to urea and reducing whole-field applications are effective strategies for nutrient management. Precision agriculture³² should be encouraged and incentivized to allow for variable rate applications. Connecting New Jersey's farming community with technology can make farming more sustainable without sacrificing productivity (USDA, 2020). Further education and outreach activities such as increased participation in the Rutgers Composting Education Program, support for the development of regional composting facilities for equine manure and incentives for smaller on and off-farm composting facilities are recommended. A needs assessment was carried out by the Organic and Regenerative Farming Board in early 2025. It was found that 76% of New Jersey's regenerative farmers rely on off-farm income to support themselves, and that 60% of regenerative farms are 10 acres or less in size. This study also found a need for more training, outreach, networking, and marketing across the State (ORFB, 2025). There is thus a population of farmers in New Jersey who see the need for these practices and desire assistance, and who would benefit from gains in revenue that these practices could provide, but would require financial assistance to enact them. (USDA, 2025; USDA, 2024c)).

Food waste and other composting inputs are frequently waste products, which often means that they are free, or that composters are paid to remove them, which can result in locally produced composts being cheaper than competing products. Currently, OCEANGRO is a NJDEP-regulated fertilizer product produced by the Ocean County Utilities Authority from biosolids at a wastewater treatment facility (Good Earth Nursery and Garden Center, 2022). Once

³² Precision agricultural refers to the use of sensing and information technologies, and mechanical systems to enable sub-field crop management. It avoids over- and under-applications of herbicides, pesticides, irrigation, and fertilizers (USDA, 2020).

composting rules revisions are made, other locally made compost products could be produced in New Jersey for New Jersey's agricultural sector.

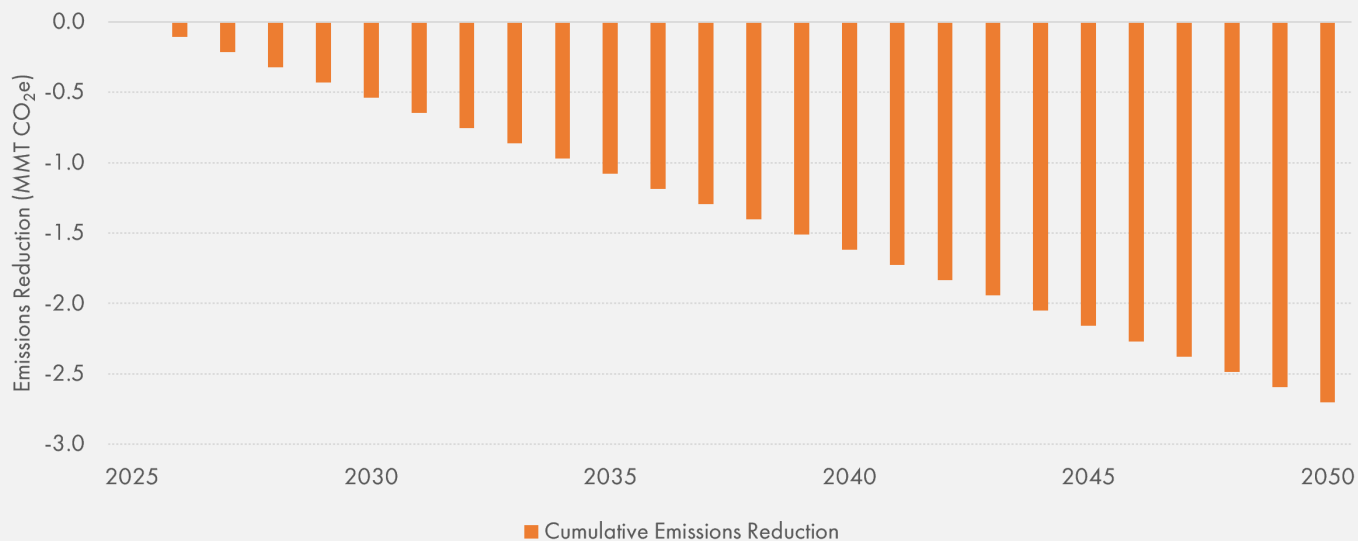
Community composting programs that allow residents to drop off food waste at no or low cost at a local composting site should also be incentivized. Local composting programs have the added benefit of serving as convenient food waste diversion opportunities for residents who may not be able to compost at home, and who are not subject to food waste recycling laws. In this way, community composting programs also serve to decrease the amount of food in the waste stream. New York City, which has roughly the same number of residents as New Jersey, has mandated separation of waste, as of April 2025 (NYCDS, 2025). Residents are required to separate compostable materials, and compost is available to residents for free. This can help communities by reducing food waste and waste in the system and providing a source of free compost for community gardens that produce fresh produce for community members. The City of Philadelphia also started implementing a community composting program in 2020. Currently, this program has 13 sites across Philadelphia plus one in Fairmount Park. Services vary by site, and help residents to compost their food waste products, and provide training and educational materials to residents (City of Philadelphia, 2025).

New Jersey could collaborate with these bordering cities to coordinate the collection, processing, and distribution of compostable material. Out-of-state landfilling is the source of 40% of NJ's landfill emissions. Composting New Jersey's food waste in state, as well as collaboration with out of state partners to build a regional composting network would enhance the health of communities across the region. This would lower the emissions from landfilled food, as well as reducing non-fuel agriculture emissions by reducing the need for nitrogenous fertilizers. Proper siting and permitting that addresses environmental impacts must be designed into approved sites. The NJDEP is currently investigating solid waste and recycling rules to facilitate community composting programs, including a tiered permitting program and streamlined requirements for community and neighborhood composting programs. In collaboration with NJDA, NJDEP aims to stand up and expand composting programs, and apply compost to 20,000 acres annually by 2050. This will reduce methane from landfilled food waste and help support locally grown food.

Measure Quantification

Using USEPA's WARM model, it is estimated that by applying compost to 20,000 acres/year, 12,000 MTCO_{2e} per year can be avoided from fertilizer offsets alone. This assuming that 20 tons of compost are applied per acre (USEPA, 2023). An additional 96,000 MTCO_{2e} of emissions can be sequestered in soil carbon as a result of compost use, for a total of 0.1 MMT CO_{2e} annually. While this is a relatively small amount, together this represents about one-quarter of estimated non-fuel agriculture emissions of 0.4 MTCO_{2e}/year. From 2025 through 2050, this would result in cumulative emissions reductions of 2.7 MMT CO_{2e} (Figure 5.15).

Figure 5.15. Cumulative Emissions Avoided by Measure 3, Encourage Precision Agriculture and Utilization of Compost on Cropland and Pasture.
This figure shows the anticipated cumulative emissions reductions for Measure 3. This assumes full implementation starting in 2026.



Priority Enabling Actions

To successfully reduce emissions from the Non-Fuel Agriculture sector, farming practices and composting will need to shift. Like waste, most emissions in this sector are from methane, and, like waste, the enabling actions rely on changes in policy and practice, not technological advances. There are regional opportunities to collaborate with surrounding states and cities to develop regional systems for composting, food waste diversion, and agriculture that result in emissions reductions across the area.

Enabling Action 3.1 Revise recycling rules to streamline community composting and consider tiered permitting

Feedback from stakeholders has indicated that New Jersey's composting rules for food waste are seen as a barrier to composting. Revisions, potentially including tiered permitting, would help to solve this issue, and thus lead to more food waste composting opportunities. A revised system would add a pathway for existing windrow composting facilities to switch from R&D permits to permits that would allow them to accept food waste from more sources. Any location is unique in terms of community capacity, agricultural opportunities, sources of food waste, and opportunities for diversion. As such, creating a permitting system that recognizes these differences and maximizes potential sources of compost input as well as providing compost to any potential compost users. Expanded composting in the State would serve as an outlet for food waste and other organic waste, as well as a source of valuable soil inputs for New Jersey's agricultural community. This could lower both emissions and costs associated with soil inputs.

Enabling Action 3.2 Implement local and regional composting programs, expand availability of composting Education Classes

Local and regional composting programs would allow for the pooling of resources and create opportunities for food waste diversion. For example, school and community-based composting programs could capture food waste from residences and small businesses not subject to the Food Waste Recycling Law, and compost at a scale and cost not otherwise available to community members. Coordination among groups could reduce costs associated with waste collection. New Jersey has a thriving agricultural sector for both plants and animals; both crops and pastures could make use of locally composted soil amendments. Drop off and collection locally from residents and businesses could lower the barrier to food waste diversion. The resulting compost could be made available to commercial farms of various sizes, community gardens, senior centers, and educational institutions from kindergarten through higher education. Since transportation can be a major cost and emissions source both for food waste collection and composting operations, enabling composting at an appropriate scale reduces both barriers. Having more composting experts would help to expand composting programs in New Jersey. The Rutgers Composting Education class regularly has full enrollment. Funding for additional offerings would result in more composting experts across the State, thus facilitating the adoption of composting by more towns, counties, businesses, schools, and residents.

Enabling Action 3.3 Encourage and incentivize precision agriculture; create guidelines for efficient fertilizer application

The NJDA has identified this area as a specific avenue for reducing methane emissions. As of September 2025, NJDA has awarded 4 applications, each with a cap of \$25k for the purchase of a manure spreader. The grant lifespan is 3 years and has a "community-use" component. Additional funding would enable this program to be expanded, thus further reducing the unnecessary over-application of nitrogenous fertilizers. Linking this program to composting programs would also provide an outlet for composted food waste. Making compost cheaper and more readily available within the State would help to achieve this goal, and serve the interests of New Jersey's agricultural community, as well as New Jerseyans who consume their products. Revisions to New Jersey's Fertilizer Law (enacted in 2011) would also support more efficient fertilizer use. The rule prohibits fertilizer application from November 15th to March 1st, or when ground is frozen, and within 25 feet of a waterway; also, phosphorus may not be applied without soil testing results that identify deficiency.

Table 5.8. Measure 3 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Revise recycling rules to streamline community composting and consider tiered permitting	Ongoing	NJDEP
Implement local and regional composting programs; increase participation in the Rutgers Composting Education class.	Ongoing	NJDEP, NJDA, local governments, Rutgers
Encourage and incentivize precision agriculture; create guidelines for efficient fertilizer application	Ongoing	NJDA

Table 5.9. Measure 3 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
Medium
Secured Funding
Most of this work is ongoing, and has funding, though it would benefit from increased funding. NJDEP is already in the process of revisiting composting rules, NJDA already provides Nutrient Management Grants, Rutgers already provides the composting class. In 2024, the USDA awarded New Jersey agricultural organizations \$801,000 in Specialty Crop Block Grants (NJDA, 2024). This is an annual program, and these funds can be used to enhance the competitiveness of local produce, and engage in research that improves efficiency and reduces costs. Therefore, this program could help to fund composting programs on farms under the right circumstances. Past recipients have included farms, non-profits and the State Agricultural Experiment Station.
Funding gaps + opportunities
A range of composting and precision agriculture and composting programs exist, however the goal of applying compost to 20,000 acres by 2050 and lowering non-fuel agricultural emissions would require a greater investment in composting programs. Specifically, funds could be allocated to community and school-based composting programs, and to the development of regional composting programs to serve New Jersey’s agricultural sector in collaboration with bordering states and cities. Running additional composting class sessions would require additional funding, especially if these were to highlight expanded regional composting coordination. NJDA has sought additional funding from NRCS and USDA to expand the Nutrient Management Plan, and to promote NRCS Conservation Reserve Enhancement Program (CREP) and Environmental Quality Incentives Program (EQIP) on farms. While revising regulations to expand composting is desirable, funding to study local impacts, and building out capacity for local and regional programs will serve as a force multiplier in establishment of these programs. North Jersey Resource Conservation and Development Program (NJRC&D) would be a likely partner in the northern parts of the State, and potentially the State could provide matching funds for some of their grant programs, for example. To date, NJRC&D estimates that they have mitigated at least 580 MTCO₂e through cover cropping, and a high of 1,800 MTCO₂e in 2025³³. Given their work and expertise in this space, they would be a possible partner for future measures. The New Jersey Organic and Regenerative Farming Board would be another organization that could help direct funds to where they would produce the greatest impact. Collaborating with the New Jersey Composting Council to establish best management practices and establish right-size tiers for permitting can help streamline the process. New Jersey could take pointers from and collaborate with composting programs being implemented by New York City and Philadelphia (City of Philadelphia, 2025; NYCDS, 2025), which are both conveniently near much of NJ’s agricultural land. A number of local composting vendors and programs have also sprouted in recent years, which may provide a starting place for grassroots composting collaboration and research (Community Compost Company, 2025; Neighborhood Compost, 2024; Torus, 2025).
Geographic Scope
Statewide
Authority to Implement
Subject to further legal review: Neither NJDEP nor NJDA has the authority to require composting on agricultural land. All of the enabling actions fall under State authority. NJDEP is in the process of revising the Recycling Rules (N.J.A.C. 7:26A), which it has the authority to do. No authority is needed to expand composting classes.

³³ Figures based on communications with NJRC&D; they used COMET Planner in their estimation.

Likewise, NJDA does not require additional authority to expand their nutrient management program or other programs encouraging regional composting and precision agriculture.

Farms that are composting their own material for their own use would not need an air permit. However, if the farm accepts outside material for composting and gets financial compensation for that, including selling composting material, then they would need an air permit because that is outside of their normal agricultural activities. For community composting that is done by hand (i.e., no “equipment” as defined in N.J.A.C. 7:27-8), then no air permit needed. Therefore, to enable certain activities, revisions to the rules may be needed, or facilities may require permits.

Metrics for Tracking Progress

- Progress of rule revisions
- Number of composting classes offered
- Acres of land compost applied to, amount of compost provided
- Amount of traditional nitrogenous fertilizer applied/per acre measures
- Composting programs created number of composting facilities.

STAKEHOLDER FEEDBACK

NJDEP and other State agencies regularly engage with stakeholders on issues surrounding food waste, compost, and food waste recycling. This is done with non-profits such as Sustainable Jersey, food banks, and rescue organizations. In preparation of this CCAP, NJDEP reviewed prior climate-mitigation related public stakeholders' comments since publication of the 80x50 Report and hosted several listening sessions to gather additional community feedback and input and make sure that community concerns and priorities are addressed in the CCAP.

Members of the public have generally expressed that there is a lack of public understanding of the actions that reduce climate change and that outreach materials need to be more accessible. Outreach and educational materials provided by or produced in collaboration with the State need to highlight specifically how avoiding wasted food can avoid greenhouse gas emissions. Public-facing tools that help to explain concepts to the public in a way that will be understood would be helpful. Additionally, there have been calls for outreach and educational materials to be translated into languages other than English, as roughly a third of New Jerseyans speak a language other than English (Sweilem, 2024).

Generally, the public expressed disapproval of continuing or expanding waste incineration. Incinerators are polluters that disproportionately impact overburdened communities. In stakeholder sessions, participating residents echo the calls of advocacy organizations such as New Jersey Environmental Justice Alliance (NJEJA) for disincentivizing waste incineration through removing incinerators from Renewable Portfolio Standards and ceasing their ability to generate renewable energy credits (REC). Incinerators may accept waste from other states, which residents who participated in stakeholder listening sessions were strongly against. There is an appetite for a focus on zero waste systems generally, which would align with the goal of reducing and ultimately eliminating food waste. Members of the public were also supportive of waste measures adjacent to food waste, including support for reusable food ware and deposits for takeout containers, for example. Circular economy programs were also brought up as a source of employment, as well as a strategy for improving community health and reducing energy usage.

Among the land use reforms the public has mentioned, streamlining the permitting process for composting, and for small-scale and community composting in particular. Furthermore, the public would like barriers to be reduced for small-scale farming and gardening, which would be locations where locally generated compost could be applied. Residents are concerned about the negative impacts from large farms as well, commenting that:

“Many companies want to take the land, come through with diesel trucks that pollute the town and the water. They’re spraying pesticides and herbicides used at nearby farms, neighbors have to close their windows. These are contributing to health concerns in the community.” - Participant in DEP’s South Jersey Climate Action Virtual Community Listening Session held in June 2025

Use of locally generated compost as a soil amendment, regional composting collaboration, and a greater embrace of precision agricultural practices would lower the usage of pesticides and herbicides and could help to alleviate some of these health concerns in addition to implementing measures outlined in other sectors of this plan that address transportation emissions. The Organic and Regenerative Farming Board has identified areas in which there is need for and support of increased outreach, education, and technical support for precision practices that have positive climate impacts

Broadly, the measures in the Waste and Agricultural sector outlined in this document seem to enjoy public support, in particular measures to reduce, rescue and divert food waste, and those to enhance agricultural practices through precision and composting. Measures to utilize methane from WWT facilities and landfills may face some public skepticism and would require outreach and education, and clear communication about how these practices seek to be carbon negative by utilizing these practices to reduce existing methane emissions and to meet energy reliability needs rather than expand or extend fossil fuel markets or infrastructure.

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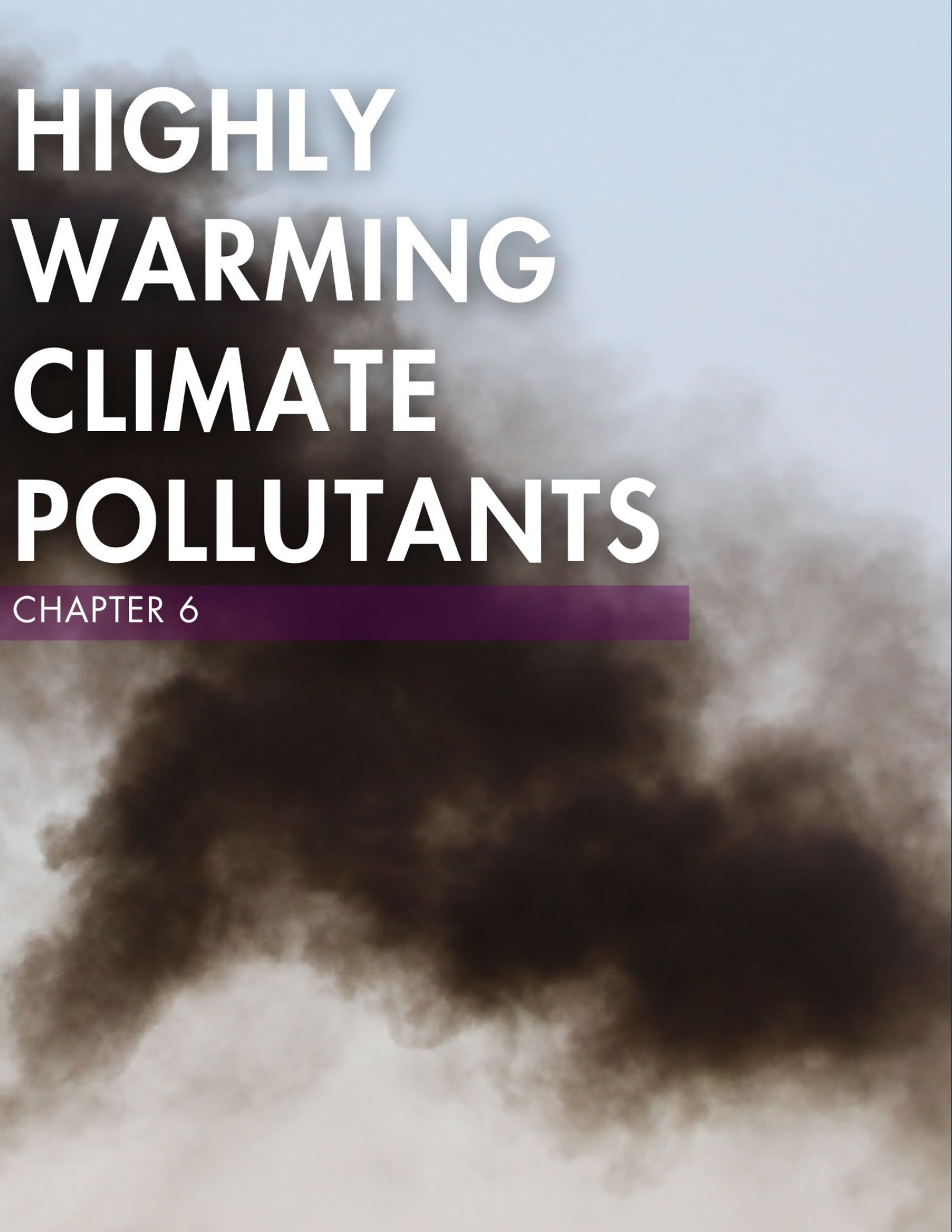
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HIGHLY WARMING CLIMATE POLLUTANTS

CHAPTER 6



HIGHLY WARMING CLIMATE POLLUTANTS SECTOR SNAPSHOT

2022 NJ EMISSIONS ACTIVITIES AND DATA

- Methane leaks occur from natural gas pipelines, service lines, compressor stations, equipment and operations such as blowdowns for maintenance of pipelines. Landfills, wastewater treatment plants, and agricultural activities also emit methane.
- Halogenated gas emissions are associated with the use of various halogenated gases in air conditioning, heat pumps, refrigeration, fire suppressants and blowing agents.
- Black carbon emissions come from the burning of biomass, forest fires, cooking and fossil fuels, particularly diesel fuel, in on-road and non-road equipment.
- Collectively, highly warming climate pollutants emitted an estimated 5.1 MMT CO₂e in 2022 based on GWP₁₀₀. The natural gas transmission and distribution (T&D) emitted 2.7 MMT CO₂e in 2022. **Currently, there is no data available for black carbon emissions in 2022. However, the latest data from 2020 reported emissions of 1.7 million metric tons of CO₂ equivalent.**

- Halogenated gases emissions
- Natural gas transmission and distribution emissions
- Total GHG emissions from all other sectors



GHGS OF CONCERN

- Methane (CH₄)
- Halogenated Gases include:
Hydrofluorocarbons (HFCs),
Perfluorocarbons (PFCs),
Sulfur Hexafluoride (SF₆)
- Black Carbon

INDUSTRIAL PRODUCTS INCLUDING HFCs EMISSIONS GOAL

1.6 MMT CO₂e

NATURAL GAS EMISSIONS GOAL

1.8 MMT CO₂e

HALOGENATED GASES GHG REDUCTION MEASURES AND ENABLING ACTIONS

Measure 1: Implement a refrigerant management program

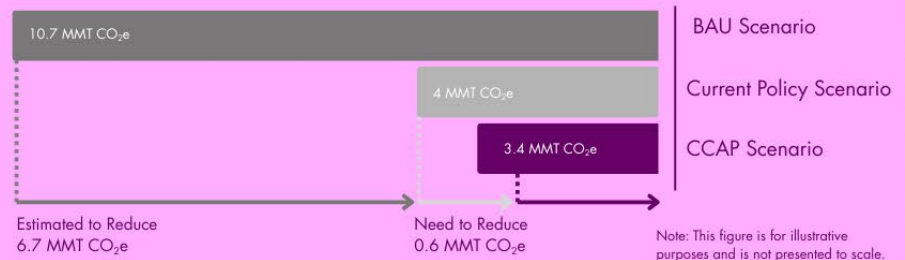
- 1.1 Convene stakeholders to inform Refrigerant Management Program (RMP)
- 1.2 Design and implement an RMP, including regulations and funding structure
- 1.3 Offer complimentary technical assistance

Measure 2: Implement a refrigerant replacement incentive program

- 2.1 Convene stakeholders to inform incentive program design
- 2.2 Design and implement a low-GWP refrigerant incentive program

Black carbon measures and enabling actions are referenced in the following chapters: Transportation; Residential and Commercial Buildings; Industry; Waste and Agriculture; Wholistic Cross Sector Approaches; and Carbon Sequestration.

2050 EMISSIONS PROJECTIONS



NATURAL GAS T&D GHG REDUCTION MEASURES AND ENABLING ACTIONS

Measure 1: Implement a mandatory emissions reduction program for natural gas T&D systems

- 1.1 Convene stakeholders to inform the design of a mandatory natural gas T&D emissions reductions program
- 1.2 Evaluate existing emissions reporting requirements and adopt a rule to establish a declining cap on emissions
- 1.3 Incorporate advanced leak detection technology into natural gas operations
- 1.4 Require natural gas companies to improve on the response times for addressing leaks and reduce emissions from blowdown events

Measure 2: Stop the expansion of natural gas T&D infrastructure and introduce non-pipeline alternatives

- 2.1 Coordinate integrated natural gas T&D infrastructure planning across multiple sectors
- 2.2 Avoid further investments in natural gas T&D infrastructure
- 2.3 Consider hydrogen blending or other low-carbon fuels as an alternative to natural gas
- 2.4 Conduct feasibility studies of non-pipeline solutions
- 2.5 Implement incentives to convert portions of the natural gas systems to thermal energy networks
- 2.6 Evaluate the role of legislation to encourage zonal electrification
- 2.7 Develop gas system planning tools, like system pruning or zonal electrification tools

INTRODUCTION

The Earth absorbs heat from sunlight and then radiates any excess heat energy back into space as infrared light. However, the loss of this heat energy to space is impeded by gases and solid particulates that absorb infrared radiation. In excess, these gases and solid particulates, which are global warming pollutants, result in the changing climate we are now witnessing. Each climate pollutant has its own physical and chemical characteristics that affect warming, but each contributes to climate change nonetheless. Although carbon dioxide (CO₂) is the State's largest contributor to global warming, other climate pollutants play substantial roles and must be reduced (Figure 6.1.1). This chapter groups together the most significant Highly Warming Climate Pollutants (HWCP) released in New Jersey and identifies opportunities for their reduction. An HWCP is a climate pollutant that absorbs substantially more infrared heat energy than an equivalent mass of carbon dioxide.

After carbon dioxide, methane (CH₄) is the second largest contributor to global warming in New Jersey. Unlike carbon dioxide, which can remain in the atmosphere for centuries, methane breaks down relatively quickly and is mostly eliminated within 12 years of its release into the atmosphere (IPCC, 2021). Methane is therefore considered a short-lived climate pollutant (SLCP). This short residence time in the atmosphere means that reductions in methane emissions are soon reflected in ambient concentrations and lead to corresponding reductions in the rate of warming. Methane is also a more potent greenhouse gas (GHG) on a weight-per-weight basis when compared with carbon dioxide, hence, it is referred to as an HWCP. A given mass of methane will retain 28 times more heat energy over the first century after release than the same mass of carbon dioxide; this is the 100-year global warming potential, or GWP₁₀₀ (IPCC, 2013). It also retains 84 times more heat energy than carbon dioxide during the first 20 years after release; this is the 20-year global warming potential, or GWP₂₀.¹

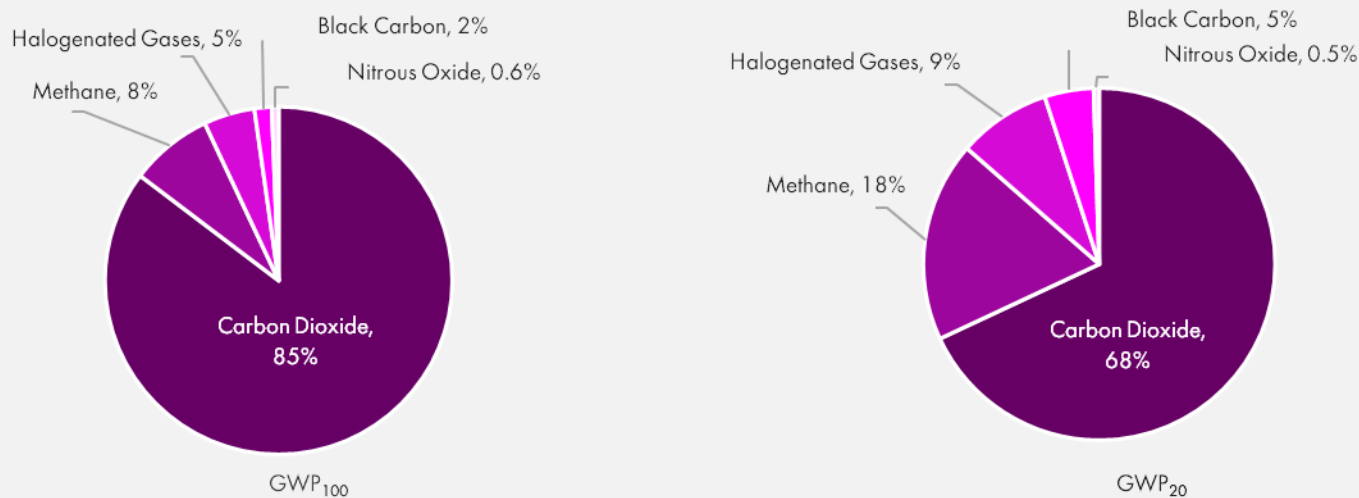
In 2022, methane accounted for 8.3 million metric tons (MMT) carbon dioxide equivalent (CO₂e) (8% of the State's gross total emissions) based on GWP₁₀₀, or 24.8 MMT CO₂e (18% of gross total) based on GWP₂₀ (Figure 6.1.1.).² Methane arises from biological processes such as those in landfills, at wastewater treatment plants, and in the decomposition of animal manure, each of which is discussed in the Waste and Agriculture chapter of this plan. Combustion of fossil fuels also creates trace amounts of methane (Figure 6.1.2.).

¹ GWP₂₀ does not account for impacts that occur after 20 years, which reduces the apparent effect of long-lived carbon dioxide. This makes the relative impact of methane appear greater.

² Emissions percentages in this discussion are based on gross totals including black carbon. They therefore do not include reductions for carbon sequestration.

Figure 6.1.1. New Jersey Climate Emissions by Percentage, 2022.

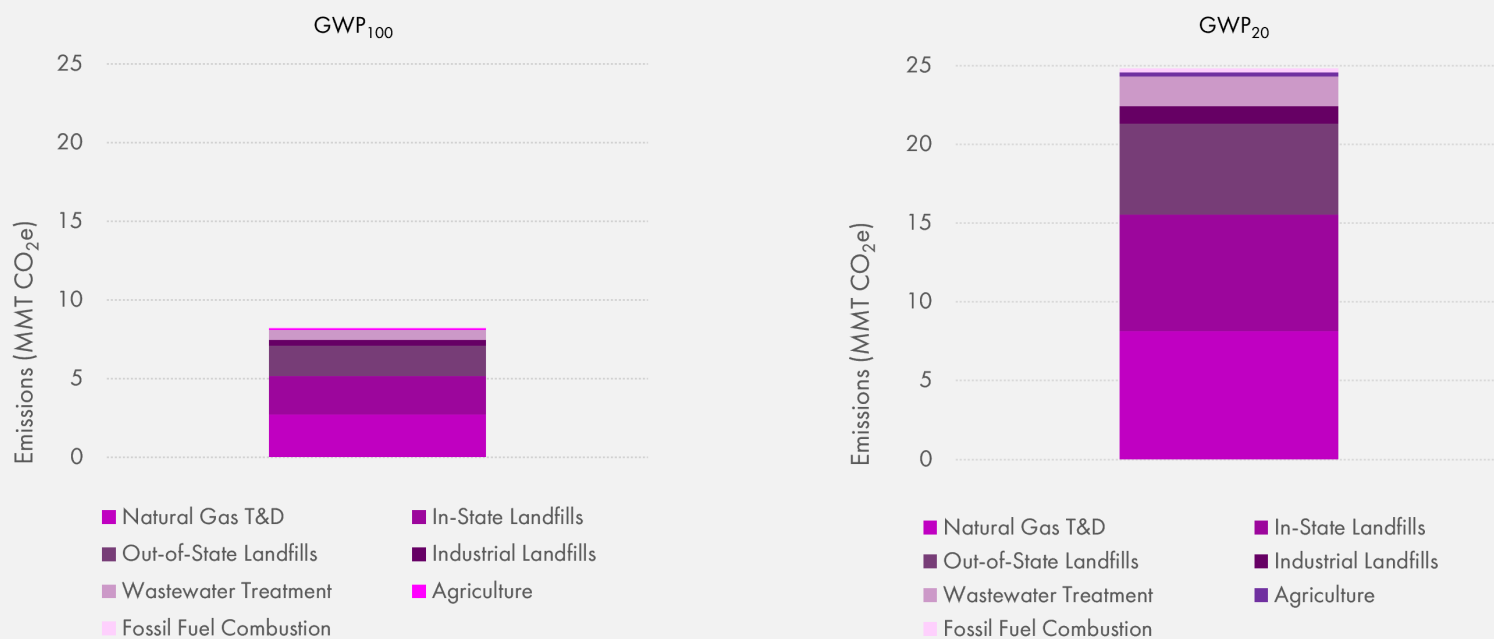
Since methane from natural gas transmission and distribution, halogenated gases, and black carbon are released into the atmosphere in smaller quantities than carbon dioxide and remain there for shorter periods, they have less impact on global warming. However, for a given mass released into the atmosphere, these pollutants have greater impacts than the same quantity of carbon dioxide. Estimates made using GWP_{100} emphasize impacts over a century and the role of long-lived carbon dioxide (left-hand chart). Estimates made using GWP_{20} emphasize the first 20 years following release and the importance of short-lived species during this time period (right-hand chart). (Total gross emissions, including black carbon: Left: 107.5 MMT CO_2e gross total; Right: 134.9 MMT CO_2e gross total).



Methane is the principal component of natural gas which leads to emissions from the operation and repair of the natural gas transmission and distribution (T&D) system, discussed later in this chapter. New Jersey does not have natural gas, petroleum or coal extraction activities like wells or mines, but elsewhere in the nation, substantial emissions have been traced to these sources. Consequently, reductions in the use of natural gas, petroleum and coal in the State will create indirect reductions at their sources. These reductions are not evaluated in this report since they occur outside the jurisdiction of the State, but they can play significant roles in fighting climate change (USEPA, 2024a).

Figure 6.1.2. Sources of Methane in New Jersey during 2022.

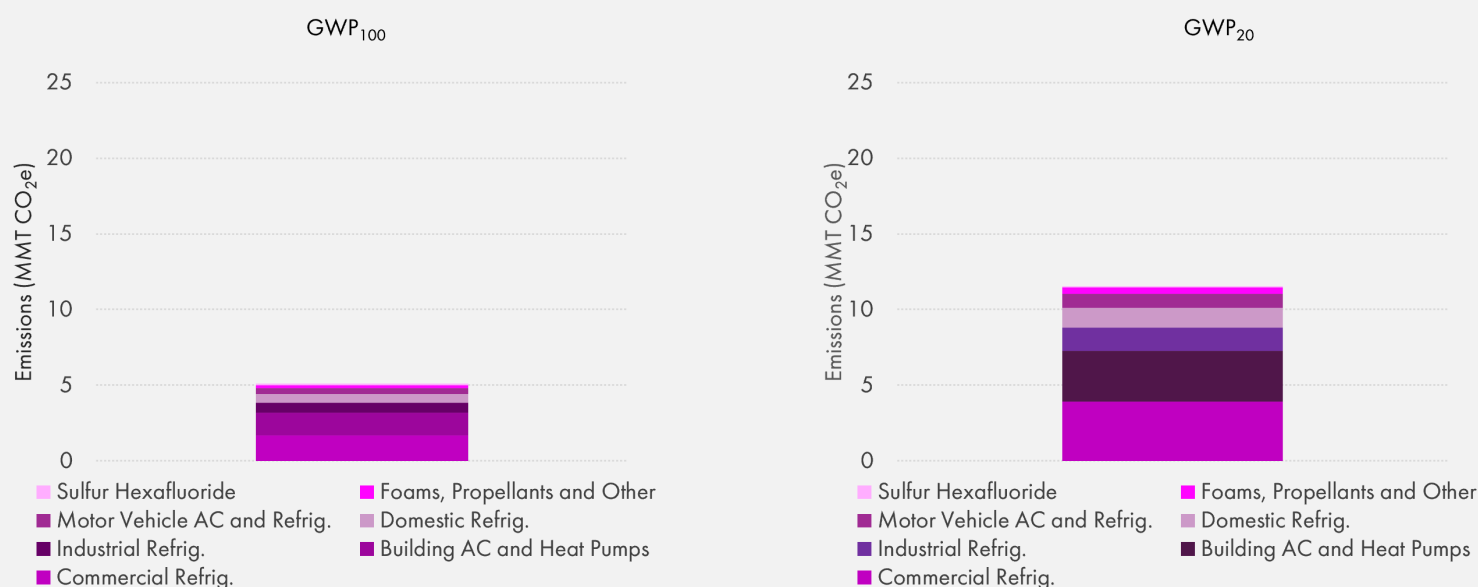
Natural gas T&D and in-state landfills are the largest sources of methane in New Jersey. Left: GWP_{100} Total 8.3 MMT CO_2e . Right: GWP_{20} 24.8 MMT CO_2e .



The third largest category of climate pollutants in New Jersey is halogenated gases, a broad family of compounds used in refrigerants, propellants, firefighting foams, foam insulation, and a range of other applications. Many of these compounds also have short lifetimes in the atmosphere and are therefore considered (SLCPs), although there are exceptions. In particular, sulfur hexafluoride (SF_6), an insulating gas used in older high-voltage electrical equipment, has an atmospheric lifetime of 1,000 years (IPCC, 2021). Based on GWP_{100} , halogenated gases were responsible for 5.1 MMT CO_2e in 2022, or 5% of gross total emissions. Based on GWP_{20} , they were responsible for 11.5 MMT CO_2e , or 9% of gross total emissions (Figure 6.1.3).

Figure 6.1.3. Sources of Halogenated Gases in New Jersey during 2022.

Commercial refrigeration is the largest source of halogenated gases emissions in New Jersey. Left: GWP_{100} with a total of 5.1 MMT CO_2e . Right: GWP_{20} with a total of 11.5 MMT CO_2e .



These estimates include hydrofluorocarbons and perfluorocarbons (collectively referred to as HFCs in this report) and SF_6 . Based on Intergovernmental Panel on Climate Change and United States Environmental Protection Agency (USEPA) protocols, they do not include chlorofluorocarbons (CFCs) or hydrochlorofluorocarbons (HCFCs), which are being phased out under the Montreal Protocol (United Nations Environment Programme, 1987).

The fourth largest source of climate emissions in the State is black carbon, a product of incomplete combustion of flammable materials such as fossil fuels and organic matter. Soot is a familiar example of black carbon. Rather than being a gas, black carbon consists of fine particles that are initially suspended in the air but which eventually settle on the ground. As a result, black carbon behaves differently in the environment than gases such as carbon dioxide and methane, which become well-mixed throughout the atmosphere. In general, black carbon has its greatest impact locally, near the point of release, and causes direct warming of the atmosphere by absorbing visible light. It also acts indirectly by interacting with clouds and by accelerating snowmelt. Black carbon was responsible for 1.7 MMT CO_2e , or 2% of the State's gross total emissions in 2022 using GWP_{100} . Using GWP_{20} , emissions were 6.1 MMT CO_2e , or 5% of the State's gross total³ (Figure 6.1.4).

³ Because it is not a gas, black carbon is not included in the State's reported net total GHG emissions estimates but is instead presented separately. However, it is included in this chapter when describing percentage of total impact.

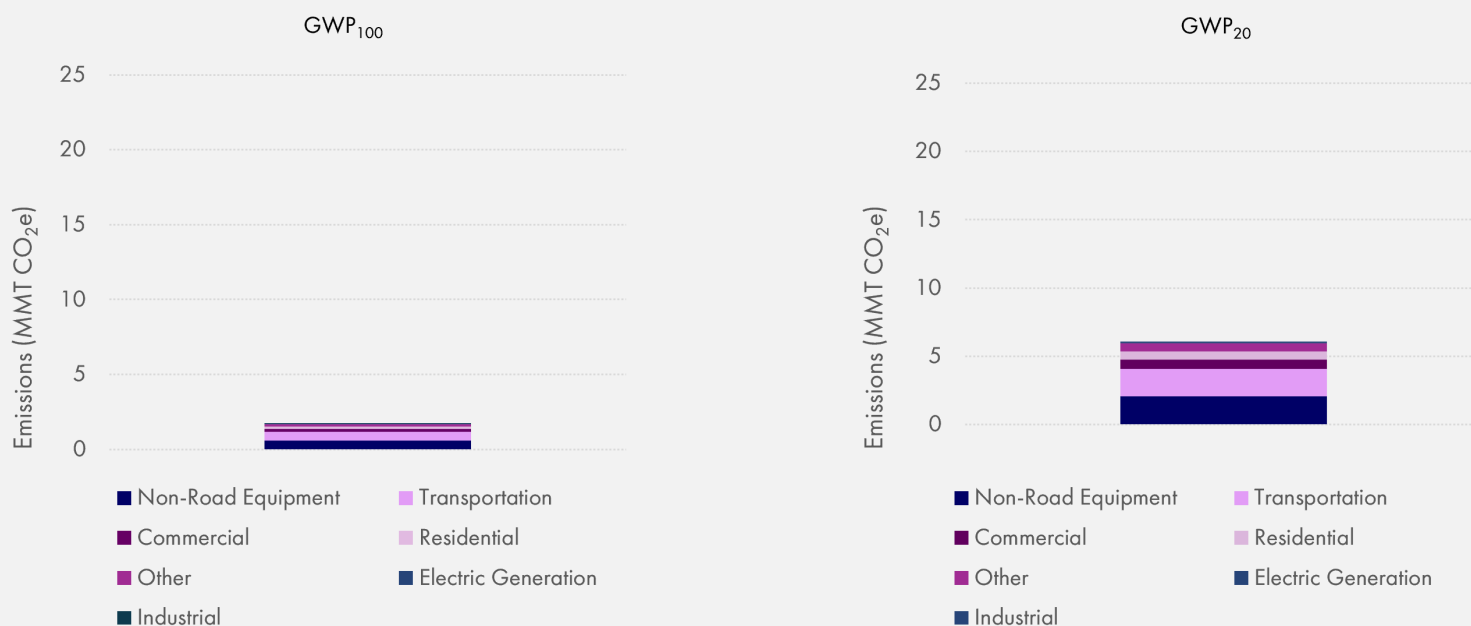
Nitrous oxide (N_2O), the fifth major climate pollutant in the State, arises from microbial action in soil and wastewater, and it is also produced in trace quantities during combustion of fossil fuels. It has a lifetime of 109 years in the atmosphere, so it is not considered an SLCP. It is however considered an HWCP. Nitrous oxide was responsible for 0.7 MMT CO_2e of the State's climate impact in 2022, corresponding to 0.6% based on GWP_{100} , or 0.5% based on GWP_{20} . Nitrous oxide emissions are discussed in the Waste and Agriculture chapter.

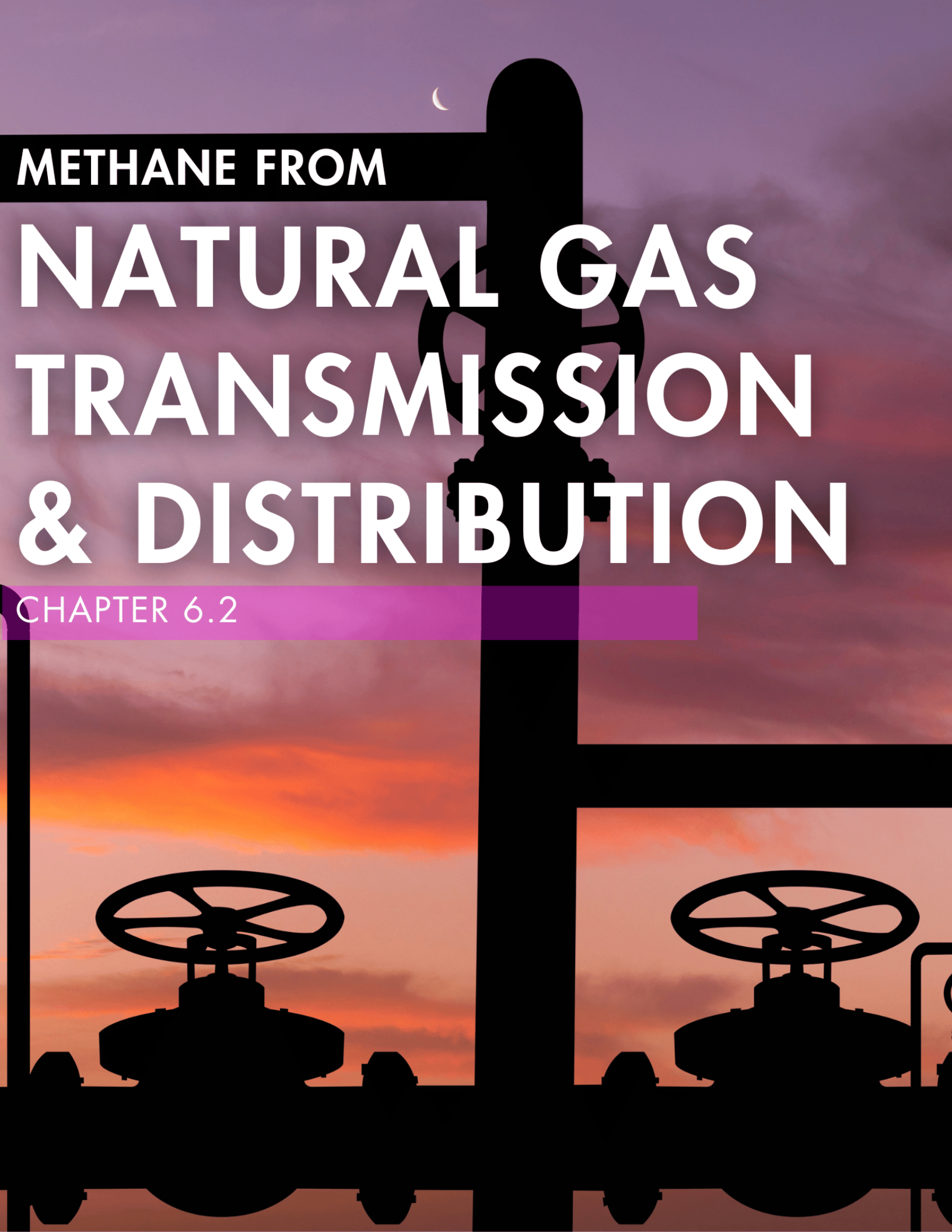
Together, methane, halogenated gases, and black carbon contributed 15.1 MMT CO_2e (14% of the State's gross total emissions) in 2022 using GWP_{100} , or 42.4 MMT CO_2e (31% of gross total emissions) using GWP_{20} . New Jersey's Global Warming Response Act (GWRA) amendments of 2019 direct the New Jersey Department of Environmental Protection (NJDEP) to evaluate these HWCPs as part of the State's comprehensive strategy to mitigate climate change.

HWCPs can be reduced in the near term, at reasonable cost, to help reduce CO_2e emissions throughout the economy. Fortunately, the State has already taken many actions that have set it on the path towards declining HWCP emissions. Successful State efforts include pipeline modernization plans to reduce methane emissions from natural gas distribution, strong efforts to reduce on-road vehicle diesel particulate matter emissions (reducing black carbon) and recently adopted legislation that establishes the statutory phase-down of HFCs in products and equipment sold in New Jersey based upon their end-use. This chapter goes into further detail about HWCPs from natural gas T&D, halogenated gases and black carbon. Methane from waste and agriculture is addressed in Chapter Five of this plan.

Figure 6.1.4. Sources of Black Carbon in New Jersey during 2022.

Non-road equipment and transportation are the largest sources of black carbon emissions in New Jersey. Left: GWP_{100} Total 1.7 MMT CO_2e . Right: GWP_{20} 6.1 MMT CO_2e .





METHANE FROM NATURAL GAS TRANSMISSION & DISTRIBUTION

CHAPTER 6.2

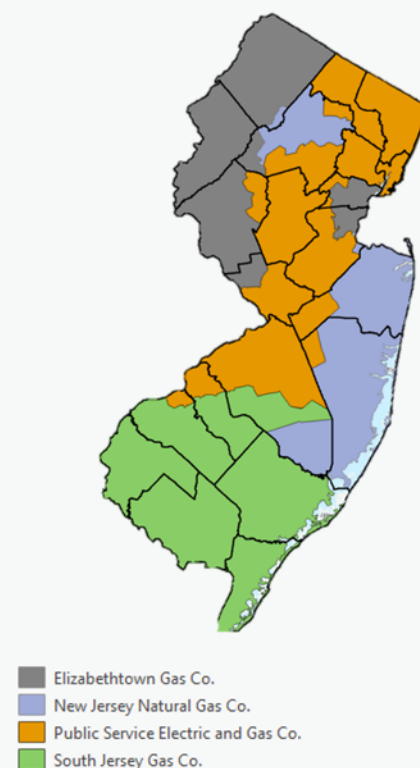
OVERVIEW

Natural gas is a versatile, cleaner-burning fossil fuel valued for its ability to be transported by pipeline across great distances. It provides energy for heating, electricity generation, and a range of industrial applications central to the New Jersey economy. However, the pipeline-quality natural gas used in New Jersey consists primarily of methane (typically above 85%) (USEPA, Air Emissions Factors and Quantification. AP 42, Fifth Edition., 1998), and lesser amounts of other gases. Releases of uncombusted natural gas to the environment must therefore be minimized and ultimately eliminated to the greatest extent possible in order to control climate change. These actions are in addition to the transition away from fossil fuels in general, as discussed in other chapters of this plan.

Climate pollutant emissions from combustion of natural gas as a fuel source in New Jersey's Industrial Sector, Residential and Commercial Buildings Sector, and Electricity Generation and Demand Sector are described in their respective chapters elsewhere in this report. This chapter, in contrast, addresses methane emissions directly to the atmosphere that originate from natural gas T&D systems in the State.

While New Jersey has no known natural gas reserves and does not produce or conduct post-extraction processing of natural gas (USEIA, 2019), the State does have several high-pressure natural gas transmission pipelines, four natural gas local distribution companies (LDCs) (Figure 6.2.1.), and a number of liquid natural gas storage facilities (NJBP, 2020a; PHMSA, 2020). Interstate natural gas transmission pipelines transport natural gas from production basins, such as the Marcellus Shale in Pennsylvania, to customers in and through New Jersey to neighboring states. LDCs receive natural gas from transmission pipelines, step down the pressure at city gate stations, and then deliver natural gas through a distribution pipeline network to residential, commercial, and industrial customers (Figure 6.2.2.). Some large industrial customers, such as manufacturing and gas-fired electric power generation facilities, are served directly by transmission pipeline companies. Combined, the State's T&D companies owned and operated over 1,500 miles of transmission pipeline, over 36,000 miles of distribution mains, and 2.4 million service connections during 2024 (PHMSA, 2025a).

Figure 6.2.1. Map of New Jersey Local Distribution Companies.

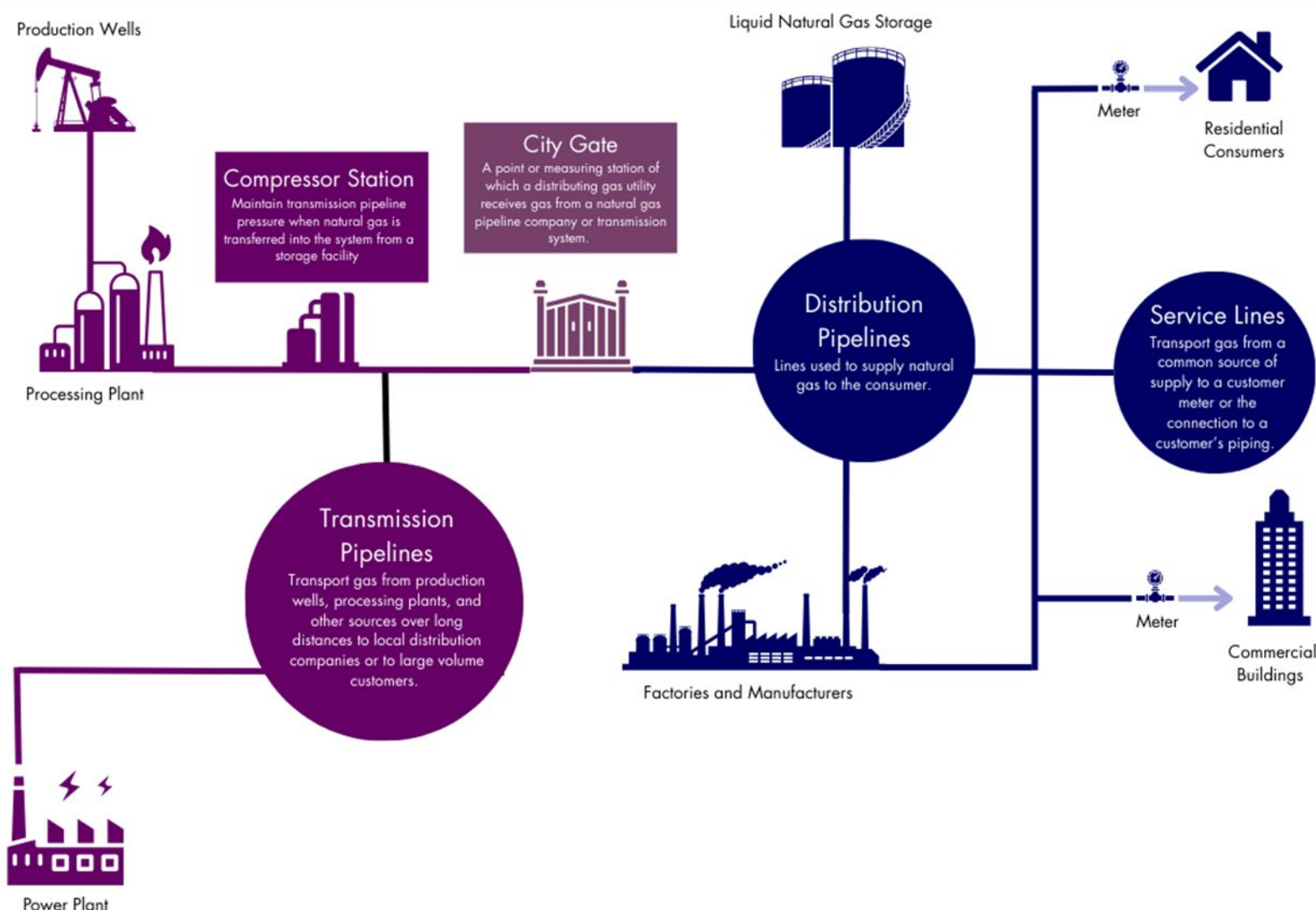


Methane emissions can occur at any stage in the natural gas supply chain, e.g., as a result of malfunctioning equipment, fugitive releases around seals and bearings, and depressurization of equipment prior to maintenance. Steps can be taken to minimize emissions from these activities, but historically the economic cost of action has not always been justified based simply on the value of the product lost. Now, with recognition of the economic and social consequences of climate change, the cost of inaction is greater, calling for a higher standard of prevention.

The future of the natural distribution system itself must also be taken into account. Reducing demand for natural gas is critical to meeting New Jersey's climate goals. The 2024 EMP shows that New Jersey must reduce climate emissions from natural gas over the next 25 years to 1.8 MMT CO₂e in order to meet the State's statutory mandate of 80% emissions reduction by 2050 (NJBP, 2025). However, modeling suggests that reliable and dispatchable power generation like that provided by gas turbines may be needed during infrequent lapses in renewable supply, for example when wind, solar and battery storage are unable to fully meet demand. Repurposing existing infrastructure to carry renewable biogas, or to carry carbon dioxide to permanent storage locations, are examples of options that may require the continued use of existing natural gas T&D infrastructure. In the present timeframe, however, New Jersey can immediately focus on repairing existing leak-prone natural gas equipment and infrastructure, and limit expansion of the natural gas distribution network.

Figure 6.2.2. Diagram of Natural Gas Infrastructure.

Production and delivery of natural gas relies on a complex network of facilities and pipelines.



WHERE WE STAND

NJDEP estimates that the natural gas T&D sector emitted 2.7 MMT CO₂e in 2022 (GWP₁₀₀), corresponding to 33% of total methane emissions and 3% of the State’s gross total emissions from all sources. Using the short-term time horizon of the GWP₂₀ metric, estimated emissions in 2022 were 8.1 MMT CO₂e, corresponding to 33% of total methane emissions and 6% of the State’s gross total emissions.⁴ Since 2005, emissions have consistently ranged between 2.7 MMT CO₂e and 3.2 MMT CO₂e (GWP₁₀₀), or between 8.0 and 9.5 MMT CO₂e (GWP₂₀) (Table 6.2.1).

In 2022, it is estimated that 81% of methane emissions from natural gas T&D systems came from distribution operations, and 19% came from transmission operations (Figure 6.2.3.). Emissions from the distribution system were largely from service lines (53% of the sector total), followed by emissions from distribution pipelines and associated infrastructure (28%).

In 2022, Natural Gas T&D was estimated to release 2.7 million metric tons of CO₂e based on GWP₁₀₀.

Table 6.2.1. Annual Natural Gas Transmission and Distribution Greenhouse Gas Emissions 2005 – 2022 (MMT CO₂e).

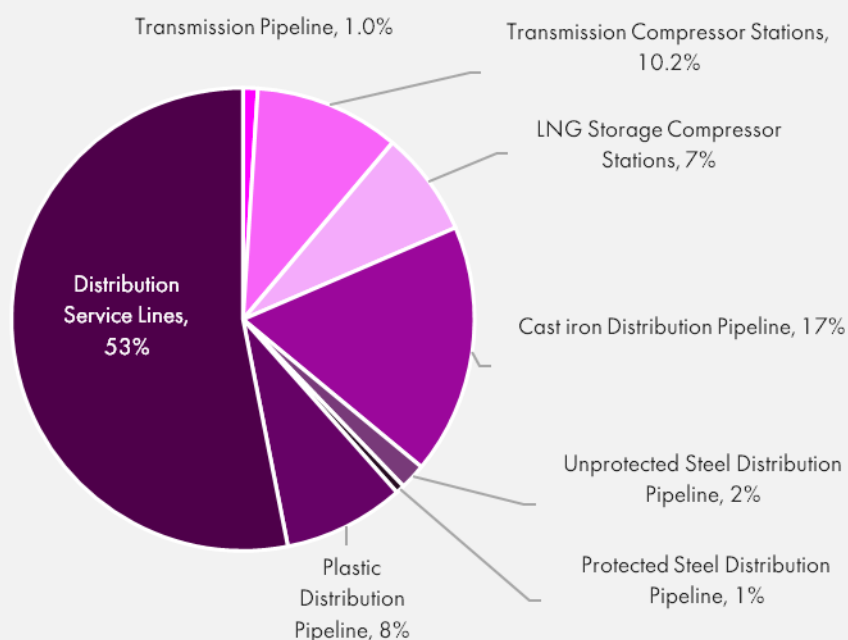
	2005	2006	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
GWP ₁₀₀	2.8	3.1	3.1	3.1	3.0	2.9	2.9	2.8	2.7	2.7	2.7	2.7
GWP ₂₀	8.5	9.2	9.2	9.2	9.0	8.8	8.7	8.4	8.2	8.8	8.1	8.1



⁴ Methane has a roughly 28 times greater impact on climate than carbon dioxide over a 100-year period. This factor is referred to as the 100-year global warming potential, or GWP₁₀₀, and it is taken from the IPCC Fifth Assessment Report. Over the first 20 years after following release to the atmosphere, though, methane has 84 times more impact than carbon dioxide, referred to as its GWP₂₀ value. USEPA and IPCC publish data based on GWP₁₀₀ values when reporting climate emissions; New Jersey provides data based on both GWP₁₀₀ and GWP₂₀.

Figure 6.2.3. Natural Gas Transmission & Distribution Emission Sources by Percentage, 2022, New Jersey.

Releases associated with the distribution network accounted for 81% of the total, while those arising from the transmission network accounted for 19%.



New Jersey estimates emissions from the natural gas T&D system using the USEPA State Inventory Tool, which in turn is based on assumed emissions factors per mile of pipeline, per service connection, and per compressor station (USEPA, 2025a). These factors are derived from national historical experience rather than New Jersey-specific conditions. As a result, while this approach identifies the approximate emissions expected in the State, it cannot fully account for the benefits of State-specific policies and practices implemented over the course of the past 20 years.

These caveats notwithstanding, New Jersey's inventory does account for expansions in the number of miles of transmission pipeline,⁵ number of compressor stations,⁶ miles of distribution pipeline,⁷ and number of service lines.⁸ The likelihood of pipeline leakage is also taken into account in the USEPA tool by assigning higher emissions factors to leak-prone cast iron and unprotected steel pipe compared to protected steel and plastic pipeline (Table 6.2.2).

Table 6.2.2. Emission Factors for Distribution Pipelines.

Older cast iron pipes represent significantly greater potential for leakage than pipes made of newer materials. Source: USEPA State Inventory Tool, Version 2025.1 (USEPA, 2025a)

Distribution Pipeline Material	Emission Factor*
Cast Iron	5.80
Unprotected steel	2.12
Protected steel	0.06
Plastic	0.37

* Metric tons methane per year per mile of pipeline

Much of New Jersey's natural gas distribution infrastructure was installed prior to the 1950s, and these older pipelines are typically made of cast iron and unprotected steel which are more likely to leak than the protected steel and durable plastics phased in after that time (Matthau, 2016). The leaks themselves are caused by disturbances resulting from earth movement, breakdown of joints, corrosion of unprotected steel pipelines, and from the natural process of 'graphitization' of iron pipelines. Graphitization is the process of iron degrading over time to softer elements. This process makes iron pipes more prone to cracking. Leaks are much less likely to occur in plastic and protected steel pipes (USEPA, 2014).

⁵ Transmission pipelines are large diameter, high-pressure lines that transport gas from production fields, processing plants, storage facilities, and other sources of supply over long distances to local distribution companies or to large volume customers (USEPA, 2025b).

⁶ Compression Stations maintain transmission pipeline pressure when natural gas is transferred into the system from a storage facility. (USEPA, 2025b)

⁷ A distribution line is a line used to supply natural gas to the consumer. A distribution line is a network of piping located downstream of a natural gas transmission line. As defined in natural gas pipeline safety regulations, a distribution line is a pipeline other than a gathering or transmission line (PHMSA, 2025b).

⁸ Service lines transport gas from a common source of supply to a customer meter or the connection to a customer's piping (PHMSA, 2025b).

In 2022, New Jersey had about 2,900 miles of older cast iron pipelines, and these lines were responsible for 17% of the emissions from the natural gas T&D sector (PHMSA, 2025a). In fact, New Jersey had 16% of the total remaining inventory of cast iron distribution pipelines in the United States that year (PHMSA, 2025a). However, regulated utilities have been replacing distribution pipelines made of leak-prone materials with polyethylene (Urena, 2020). Service lines are also being replaced with plastic (Figures 6.2.4. and 6.2.5) (PHMSA, 2025a). Offsetting the emissions benefits of these initiatives, the number of miles of distribution mains grew by 3,600 miles, or 11%, between 2005 and 2022. The number of service lines also increased by 210,000 connections, or 10%. These facts serve as the starting point for targeted policies to reduce emissions from the existing natural gas T&D while at the same time transitioning to a clean energy future.

Figure 6.2.4. Miles of Natural Gas Transmission Line by Material.

The total miles of installed pipeline grew 11% between 2005 and 2022, offsetting the benefits of replacing leak-prone cast iron and unprotected steel pipes (PHMSA, 2025).

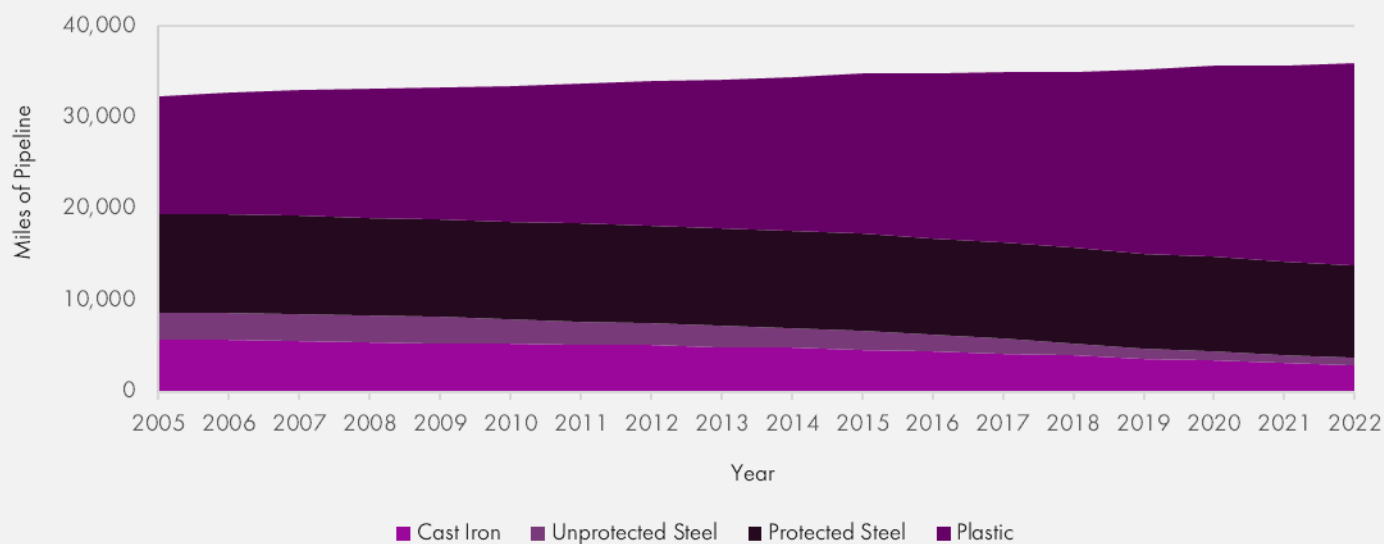
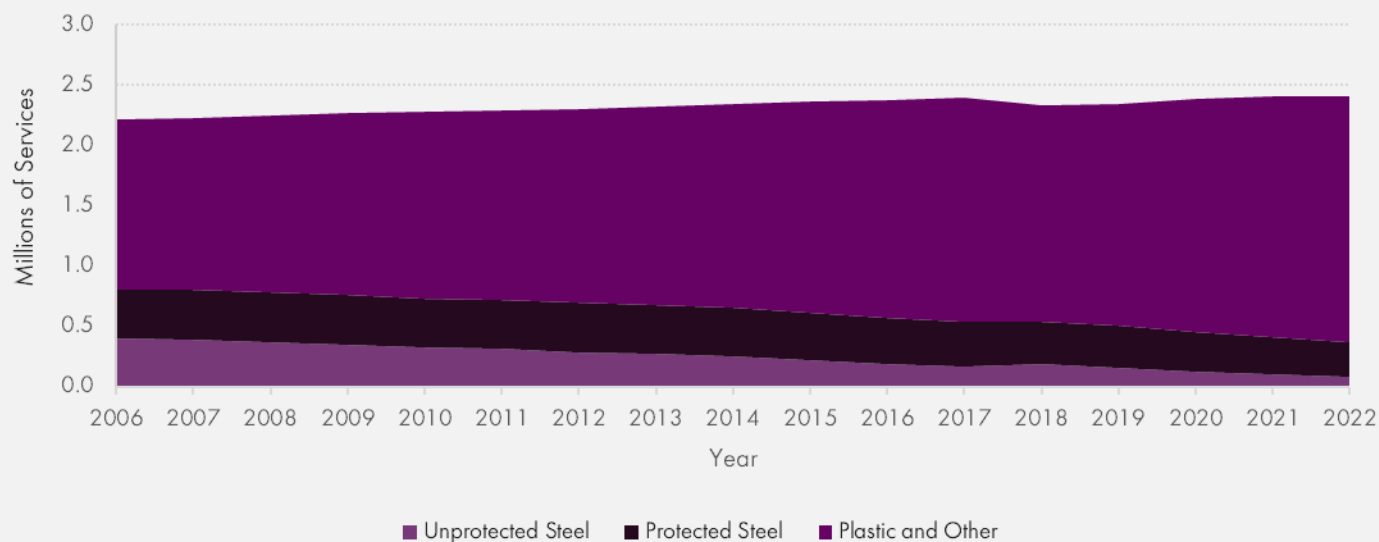


Figure 6.2.5. Number of Natural Gas Service Lines by Material.

The total number of service lines grew by 10% between 2005 and 2022, offsetting the benefits of replacing old, leak-prone services lines with ones made of newer, more reliable materials (PHMSA, 2025).



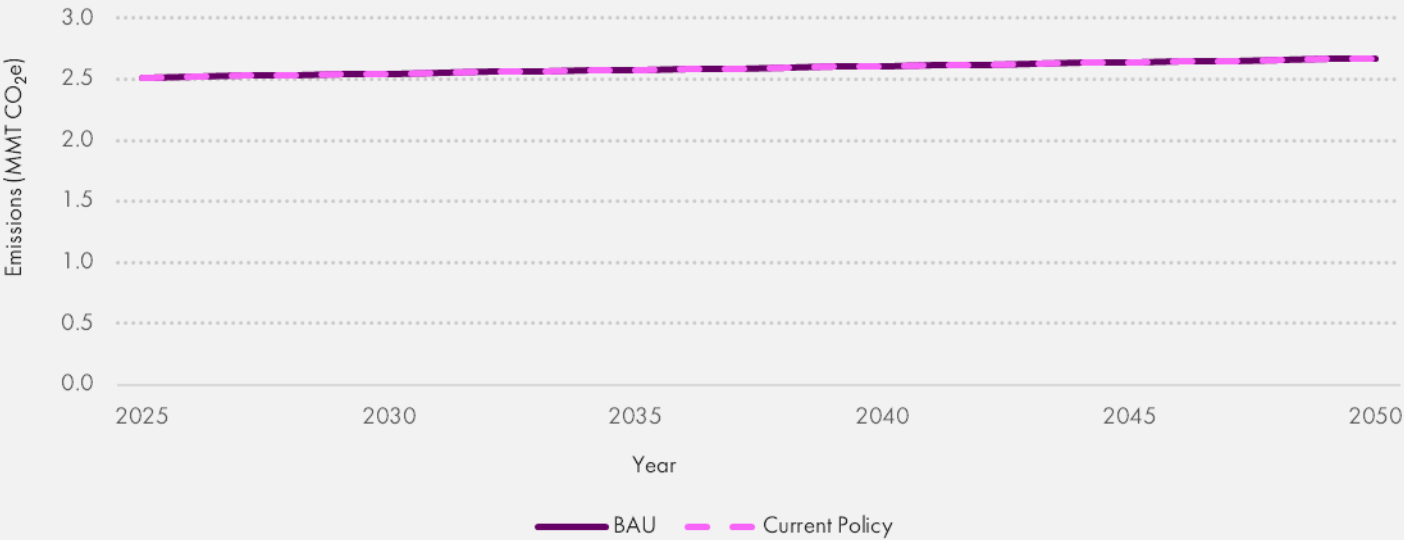
Business-as-Usual and Current Policy Scenario

In order to compare the relative impacts of various policy alternatives, it is useful to establish a baseline that separates out as many confounding factors as possible, thereby permitting alternatives to be considered on their own. The Current Policy Scenario reflects the projected outcomes based on existing policies and their anticipated continuation, serving as a benchmark or progress report for the impact of policies currently on the books. For the purposes of this chapter, the Business-as-Usual (BAU) projection and Current Policy projection are combined to assume the following:

- Emissions from the natural gas T&D sector grow at a constant rate of 0.51% per year based on projected expansion of the natural gas system (USEPA, 2019); and
- The State takes no additional measures to constrain emissions growth.

Both the BAU and Current Policy Scenarios yield the same result due to lack of introduced policy measures, resulting in a slight increase in emissions in 2050, totaling 2.7 MMT CO₂e (Figure 6.2.6)⁹.

Figure 6.2.6. Natural Gas T&D Emissions in the BAU and Current Policy Scenarios.
Natural Gas T&D sector emissions are predicted to slightly rise through 2050 under a Business-As-Usual and Current Policy Scenario to 2.7 MMT CO₂e.



Critical Emissions Reduction Policies Adopted Since 2020¹⁰

Decarbonizing the natural gas T&D sector requires a concerted effort between the Department, the New Jersey Board of Public Utilities (NJBPU), and LDCs. The NJBPU oversees distribution pipeline construction and safety standards for the State. Natural gas transmission pipeline construction and safety standards are established by federal authorities (United States Department of Transportation, Pipeline and Hazardous Materials Safety Administration). Transmission companies that utilize large compressors and distribution facilities that employ combustion equipment are required to have approved air emission operating permits from the NJDEP and must report emissions from these sources through the Emissions Statement Program.

Since 2020, there have been several State policies advancing the monitoring and planning of natural gas T&D systems, setting the stage for enhanced policies aimed at decarbonizing this sector.

⁹ When accounting for updated data in the 2024 EMP modeling from (PHMSA, 2025a), actual starting emissions are likely to increase by 0.2 MMT CO₂e.

¹⁰ Refer to the 80x50 GWRA report for a summary of relevant policies prior to 2020 (NJDEP, 2020).

Executive Order No. 317

Through Executive Order 317, Governor Murphy directed State agencies to launch a regulatory proceeding to consider cost effective market mechanisms, reliability, alternative utility investments, elimination of subsidies, long-term impacts of customers who fail to or are unable to switch from natural gas, and preparations needed to prepare the electric grid to handle electrification of additional end-uses (EO 317, 2023). Additionally, Executive Order 317 requires gas utilities to submit plans that align with the State's interim GHG emission target to reduce emission 50% by 2030. In summer 2023, the NJBPU hosted a Future of Natural Gas Proceeding, and anticipates submitting a recommendation report in the near future.

Greenhouse Gas Monitoring and Reporting Rule

Effective in 2022, the NJDEP adopted the Greenhouse Gas Monitoring and Reporting Rule (GHGMRR) (N.J.A.C. 7:27E, 2022), which in part, provided a new reporting framework for natural gas distribution systems in the State. This rule requires LDCs to document and report their main and service line leaks and blowdown events, and associated methane emissions. This information is to be submitted as part of each utility's annual Pipeline Modernization Report. The GHGMRR aims to enhance the State's ability to track progress in reducing emissions and to inform policy decisions related to climate change mitigation. By establishing a standardized reporting system, the rule encourages transparency and accountability in managing methane emitted from natural gas T&D.

Leak Grading and Repair Rule

NJBPU has regulations requiring that gas leaks that are discovered are investigated and assigned a grade classification based on their severity (N.J.A.C. 14:7-1.19, 2025). Effective July 1, 2023, NJBPU introduced new grading criteria and repair timeframes for monitoring and repairing leaks. These requirements for classifying and repairing non-hazardous leaks are not found in the United States Department of Transportation regulations, located at Title 49 of the Federal Code, but are consistent with the Protecting Our Infrastructure of Pipelines and Enhancing Safety Act of 2020, P.L. 116-260, 49 U.S.C. §§ 60101 et seq., as amended (known as the PIPES Act of 2020) (N.J.R., 2022). Previously, only hazardous (Grade 1) leaks were explicitly required to be repaired.

There are three leak grades which have corresponding priority levels and repair times: Grade 1 represent an existing or probable hazard to persons, property, or the environment that shall be repaired immediately or require continuous action until the hazard is eliminated; Grade 2 leaks are determined by the operator to be non-hazardous at the time of detection, but pose an environmental threat and have the potential to become a future hazard to persons or property, and are intended to be repaired within 6 months; Grade 3 leaks are determined by the operator to be non-hazardous at the time of detection and are expected to remain non-hazardous to persons and property, but pose a potential environmental threat, and must be eliminated within 2 years. Leaks must be periodically reevaluated every 6 months.

To reduce the costs of compliance, the NJBPU employed a phased approach for legacy leaks (leaks discovered before July 1, 2023). Operators had until June 30, 2025 to repair Grade 2 legacy leaks, with at least 50% repaired by June 30, 2024. Operators have until June 30, 2027 to repair Grade 3 legacy leaks, with at least 25% of total legacy leaks repaired each year and reevaluated based on the maintenance practices in effect at the time of leak discovery.

Infrastructure Investments and Modernization

New Jersey's LDCs are regulated utilities and must receive authorization from the NJBPU to undertake capital improvement programs, such as pipe repair and replacement. Maintenance, repair and replacement of natural gas infrastructure have historically been driven by safety and reliability considerations, rather than minimizing product losses. Safety is the primary driver in part because the costs associated with these capital improvements typically far exceed the economic value of avoiding losses of natural gas from leaking infrastructure absent environmental cost considerations (USDOE, 2017).

Altogether, New Jersey's LDCs plan to invest almost \$2.5 billion in infrastructure improvement and advancement programs to modernize and minimize leak prone areas (Table 6.2.3.) (NJBPU, 2022a; NJBPU, 2024; NJBPU, 2022b; NJBPU, 2020b). These efforts will help mitigate fugitive emissions and improve system integrity.

Table 6.2.3. New Jersey energy utilities' Infrastructure Improvement and Advancement Programs.

New Jersey's utilities are investing in natural gas infrastructure to modernize transmission and distribution networks and minimize leaks from pipes, among other upgrades.

Energy Utility	Total Investment	Timeframe	Transmission and Distribution Focus
Elizabethtown Gas	\$625 million	2024 – 2029	New main and excess flow valve installations, retirement of at-risk mains, low-pressure system upgrades to elevated pressure, and reliability improvements.
New Jersey Natural Gas	\$507 million	2020 – 2025	Reliability improvements, main and excess flow valve installations, regulating station upgrades, and liquefied natural gas transmission interconnection.
PSE&G	\$511 million	2022 – 2026	Electric circuits and substations modernization, natural gas metering and regulating stations upgrades, and reliability improvements to residential areas.
South Jersey Gas	\$743 million	2022 – 2027	Replacement of at-risk mains and facilities, new service lines and excess flow valve installations, and reliability improvements.

Other Enabling Policies

The State has enacted several laws seeking to pilot alternatives to the existing natural gas T&D infrastructure and further reduce GHG emissions in this sector:

- **P.L. 2020, c.38:** The State established the New Jersey Fuel Cell Task Force to increase the use of fuel cells in the State (P.L. 2020, c.38, 2020).
- **P.L. 2021, JR-7:** This Joint Resolution permits the blending of renewable fuels under the Federal Clean Air Act (P.L. 2021, JR-7, 2021).
- **P.L. 2023, c.328:** The State directed the NJBPU to evaluate the feasibility of deploying large-scale geothermal heat pumps statewide, with a report due by the end of 2025 (P.L. 2023 c.328, 2024).





THE PATH FORWARD

Given the lack of state action for targeting emission reductions in the natural gas T&D sector under the BAU and Current Policy Scenarios, current dependence on natural gas to meet New Jersey's energy demands is likely to continue over the next decade. As previously discussed, the Current Policy Scenario will result in 2.7 MMT CO₂e in 2050 in this sector alone, emphasizing the important role of establishing near-term policies to start driving down emissions. To that end, the NJDEP identified two measures under the CCAP Scenario that could spur the necessary emission reductions to reach the State's 2050 goals:

- **Measure 1:** Implement a mandatory emissions reduction program for natural gas T&D systems; and
- **Measure 2:** Stop the expansion of natural gas T&D infrastructure and introduce non-pipeline alternatives.

The State's natural gas T&D sector can achieve its emissions goal of 1.8 MMT CO₂e by 2050 under the CCAP Scenario (Figure 6.2.7.). The NJDEP estimates that implementing a mandatory emissions reduction program for natural gas T&D systems under Measure 1 and stopping the expansion of natural gas T&D infrastructure under Measure 2 could result in emissions benefits beyond this sector's goal. Specifically, implementing Measure 1 and Measure 2 could result in reductions of 0.9 MMT CO₂e and 0.5 MMT CO₂e by 2050, respectively. It is important to note, the measures described below represent one hypothetical way the State can meet its climate emission goals, not the only way. There are many pathways to decarbonization, and it is critical for the State to continually evaluate its emissions reduction progress and adapt its approach over time.

2050 SECTOR EMISSION GOAL

1.8 MMT CO₂e

EMISSION ACTIVITIES

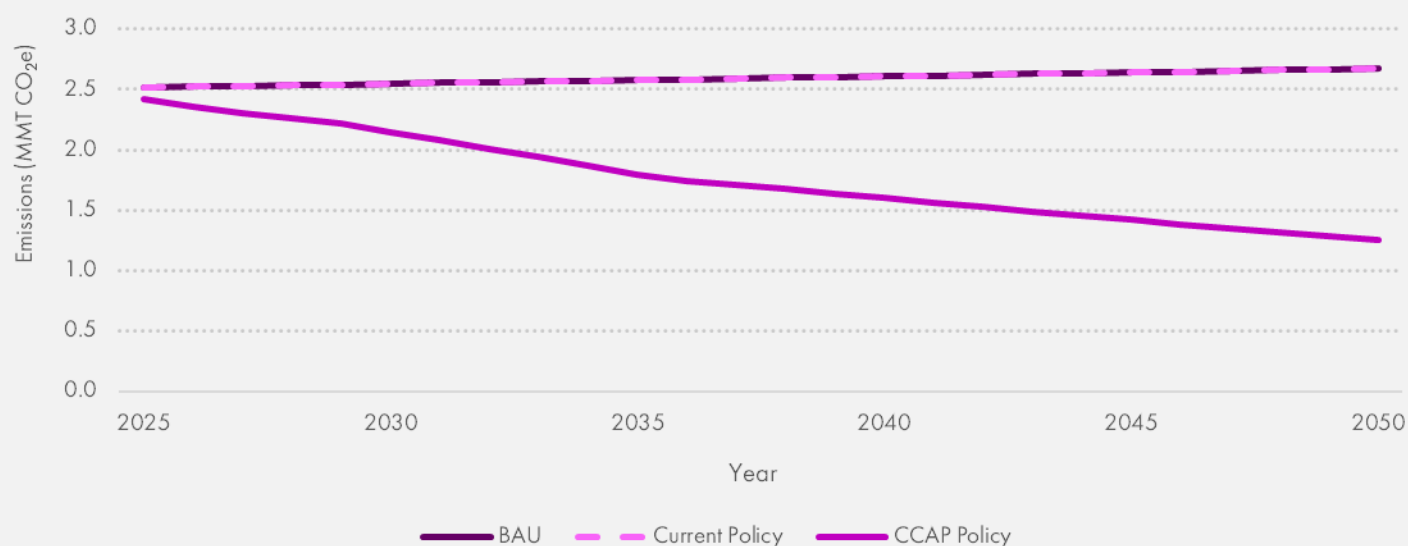
- Leak prone pipe and equipment
- Operational release of gases blowdowns
- Accidental release

EMISSIONS REDUCTION MEASURES

1. Implement a mandatory emissions reduction program for natural gas T&D systems
2. Stop the expansion of natural gas T&D infrastructure and introduce non-pipeline alternatives

Figure 6.2.7. Natural Gas Transmission and Distribution Sector Emissions under the CCAP Scenario.

Reducing emissions in the natural gas T&D sector will rely on setting a cap on emissions, stopping the expansion of infrastructure, and introducing non-pipeline alternatives, which could result in 1.3 MMT CO₂e emission reductions by 2050.



Emissions Reduction Measure 1: Implement a mandatory emissions reduction program for natural gas T&D systems

As the State's natural gas T&D emissions trajectory continues to rise, there is potential for policy interventions that set a limit on the allowable emissions released by this sector. As an example, Washington's Cap-and-Invest program set a 45% emission reductions target for natural gas T&D by 2030 that rises to 95% by 2050 (State of Washington, Department of Ecology, n.d.; RCW 70A.65.060, 2025). New Jersey could establish a similar program that sets a hard cap on this sector's emissions and require LDCs to purchase allowances to cover their annual emissions, with each allowance being equivalent to a certain metric ton of natural gas and the total number of allowances limited by the cap. LDCs that reduce their emissions below their anticipated threshold could sell excess allowances to others, creating a financial incentive to invest in emission-reducing technologies and practices. This market-based approach can encourage innovation and cost-effective emission reductions across the sector as the cap declines over time. To support this transition, LDCs will need alternative business models that include logistical and financial incentives for non-pipeline alternatives (discussed in Emissions Reduction Measure 2).

The CCAP Scenario relies on the State expanding its existing GHGMRR rule to set a cap on natural gas T&D emissions, with emissions reductions of 6% by 2030, 12% by 2035, 17% by 2040, and 29% by 2050 relative to 2022. In efforts to reach the emissions reductions goals, the State's natural gas utilities might include infrastructure modernization and strengthening of leak detection requirements for increased leak prevention as key strategies. Further, identification of cost-effective leakage mitigation will allow utilities to better prioritize and expedite methane emission reductions.

Measure Quantification

Emissions reductions from Measure 1 are projected to reduce emissions by 0.2 MMT CO₂e in 2030; 0.5 MMT CO₂e in 2040, and 0.9 MMT CO₂e in 2050 (Figure 6.2.8.). Actual emissions savings could be underestimated since it does not include possible decommissioned pipelines or reductions in service needs. Cumulative emission reductions total 0.7 MMT CO₂e in 2030; 4.6 MMT CO₂e in 2040; and 12.0 MMT CO₂e in 2050 (Figure 6.2.9.).

Figure 6.2.8 Annual emissions reductions from Measure 1, Implement a mandatory emissions reduction program for natural gas T&D systems, compared to current policies.

Annual emission reductions in the Natural Gas T&D Sector are predicted to total 0.9 MMT CO₂e by 2050 under the CCAP Scenario when compared to the Current Policy Scenario.

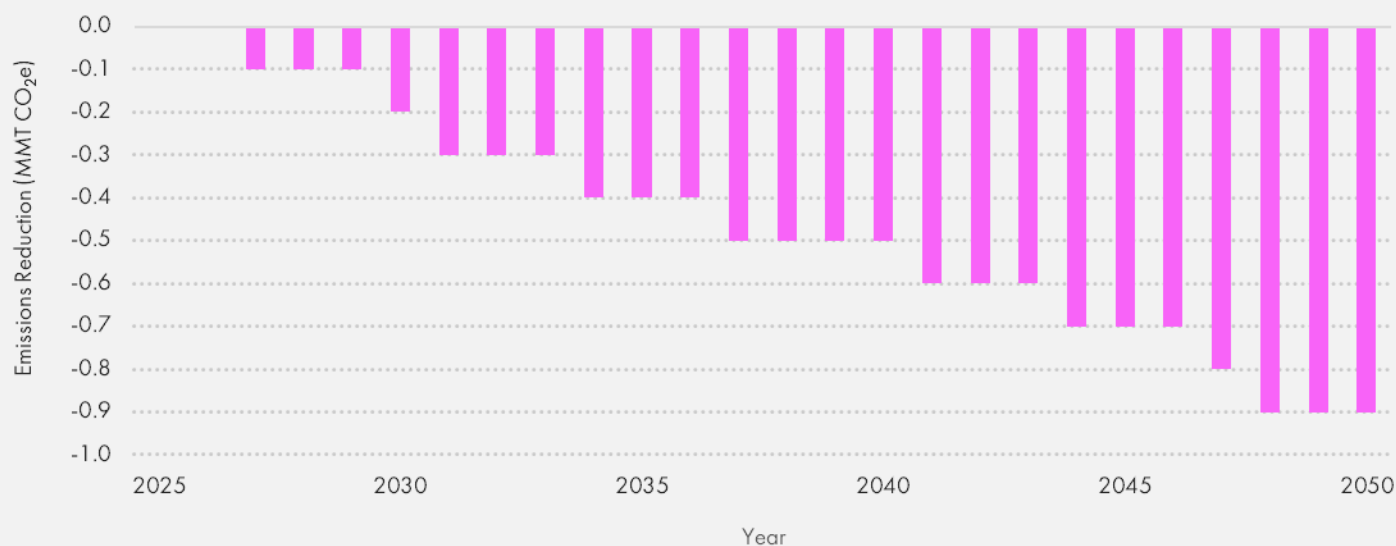
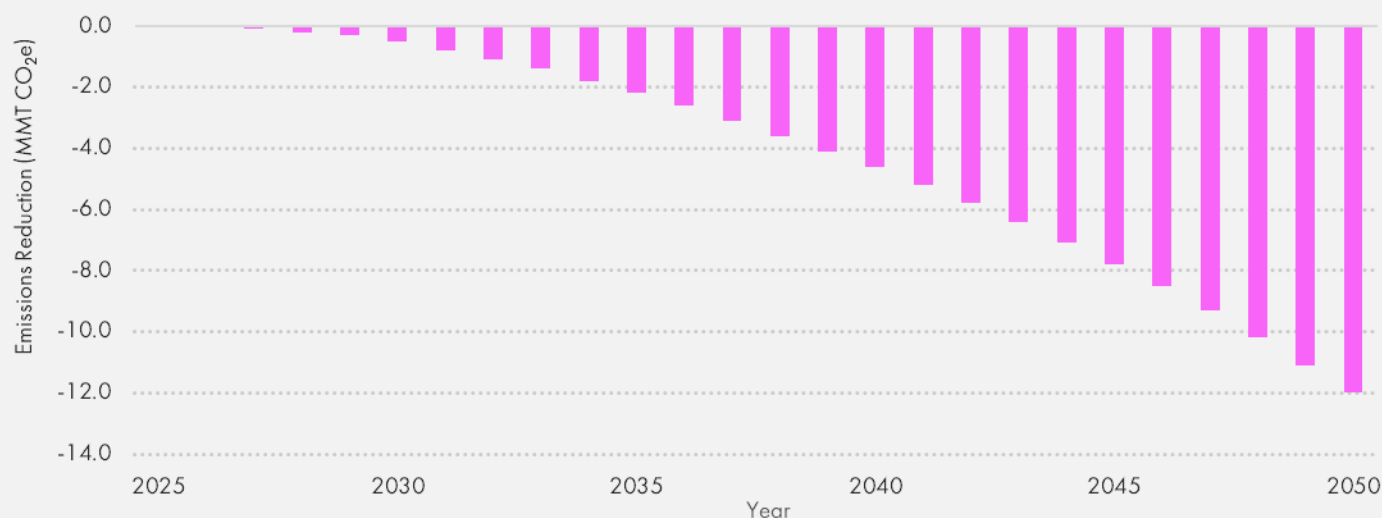


Figure 6.2.9. Cumulative emissions reductions from Measure 1, Expand the existing GHGMR rule to set a cap on natural gas T&D emissions, compared to current policies.

Cumulative emission reductions in the Natural Gas T&D Sector are predicted to total 12.0 MMT CO₂e by 2050 under the CCAP Scenario when compared to the Current Policy Scenario.



Priority Enabling Actions

NJDEP has identified four critical actions necessary to implement a mandatory emissions reduction rule on natural gas T&D emissions.

Enabling Action 1.1 Convene stakeholders to inform the design of a mandatory natural gas T&D emissions reductions program

The NJDEP, NJBPU, and energy utilities should convene a working group of pertinent stakeholders to identify emission reduction opportunities in the natural gas T&D sector and determine ideal and realistic thresholds for a potential cap

on emissions. The working group can build off the future of natural gas proceeding findings and engage in collaborative conversation to determine an optimal design of an emissions reduction program.

Enabling Action 1.2 *Evaluate existing emissions reporting requirements and adopt a rule to establish a declining cap on emissions*

New Jersey currently requires natural gas utility companies to report general information about mains and service lines, leak monitoring information, and blowdown event information to the State through the Pipeline Modernization Report (PMR), submitted as a part of the GHGMRR. The rule does not place restrictions on the amount of natural gas released and only seeks to track information from New Jersey's LDCs, and mandating emissions limits would require legislative action (NJDEP, 2024a). This rule also does not require geospatial maps of gas distribution infrastructure, which can be a useful asset for LDCs corresponding with anticipated reinforcement, replacement, or repair schedules and targeting priority locations to implement emission reduction strategies. NJDEP should evaluate its GHGMRR and emissions statement program to determine if adequate data is currently available to establish an emissions baseline to inform future regulatory development and require additional information if needed. Following this evaluation and stakeholder efforts, NJDEP could expand its existing programs to address emissions from both natural gas T&D companies by establishing a declining cap on emissions.

Enabling Action 1.3 *Incorporate advanced leak detection technology into natural gas operations*

Detecting leaks is a critical first step for pipeline operators to attain the required emission reductions proposed in this measure. Particularly, incorporating advanced leak detection can help identify, measure, and verify emissions associated with leaks. As discussed in the New Jersey Clean Air Council's 2019 recommendations report, NJDEP and NJBPU should encourage gas utilities to analyze leak detection systems to determine whether more effective leak detection and control methods or equipment are available for implementation in the near-term without unreasonable impacts to ratepayers (Clean Air Council, 2019). The use of cutting-edge leak detection and quantification methods and more frequent leak surveys will result in repairs and replacement to reduce methane leaks. As New Jersey transitions away from natural gas as the source of residential and commercial heating, additional reductions will be realized from the retirement of those distribution and service lines.

Natural gas utilities can incorporate leak flow rate data into existing replacement and repair prioritization frameworks to more quickly find, quantify, report and prioritize gas pipeline repairs and replacements. To support efforts in meeting the emissions reduction program, natural gas utilities can file repair, replacement or retirement plans with NJBPU and efficiently reduce leakage. Through ranking and ordering leak flow rate data, utilities can better identify which repairs will result in capturing more gas per dollar spent. Utilities could also incorporate a benefit-cost analysis of reported leaks to determine if non-pipeline alternatives (discussed in Emissions Reduction Measure 2) would be a more viable solution. PSE&G has demonstrated the viability of this approach through their partnership with the Environmental Defense Fund. They utilized methane mapping to inform their construction priorities (EDF, 2020). South Jersey Gas is integrating vehicle-based advanced leak detection technology and leak quantification methods into its operations; future pipeline replacements will address how advanced leak detection can be included (South Jersey Gas, 2019).

Enabling Action 1.4 *Require natural gas companies to improve on the response times for addressing leaks and reduce emissions from blowdown events*

Addressing leaks is another important and necessary method for pipeline operators to reduce emissions. Coinciding with advanced leak detection, it is crucial for natural gas companies to improve on the response times for addressing leaks, which can result in high emissions if not repaired in a timely manner. Currently, under N.J.A.C. 14:7-1.19 (2025), when a leak has been discovered, it is assigned a classification based on its severity which will determine its priority and corresponding repair time. These leaks represent lost and unaccounted for gas (LAUF). Operators must purchase and pay for LAUF that has not been delivered to the customer due to losses in the system (N.J.R., N.J.R., 2023). The current grading system requires all leaks to be repaired within 2 years; improving and enforcing repair times would reduce the amount of natural gas leaked over time.

Blowdown events are the process of depressurizing and releasing gas from a section of a pipeline or equipment, typically for maintenance, repair, or emergency purposes; natural gas is vented into the atmosphere to safely lower the pressure

within the pipeline or equipment. They are necessary for safety and operational reasons but result in the release of natural gas. Emissions from blowdown events can be mitigated through a number of methods, including using pressure control fittings, shortening line segments that need to be blown down, and rerouting gas to a lower pressure system before maintenance (EDF, 2016). By encouraging quicker response times across the various grade classifications and reducing the amount of natural gas released during blowdown events, New Jersey can directly decrease methane emissions.

Table 6.2.4. Measure 1 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Convene stakeholders to inform the design of a mandatory natural gas T&D emissions reductions program	Near-Term	NJDEP, NJBPU, Energy Utilities
Evaluate existing emissions reporting requirements and adopt a rule to establish a declining cap on emissions	Near-Term	Legislature, NJDEP, NJBPU, Energy Utilities
Incorporate advanced leak detection technology into natural gas operations	Near-Term	NJDEP, NJBPU, Energy Utilities
Require natural gas companies to improve on the response times for addressing leaks and reduce emissions from blowdown events	Ongoing	NJBPU, Energy Utilities

Table 6.2.5. Measure 1 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
High
Secured Funding
Capital improvements to natural gas T&D infrastructure are subject to cost recovery regulations that allow the utilities to pass those costs on to their consumers through rate increases.
Funding gaps + opportunities
Currently the funds from the programs below are expended, but the State should track future funding availability. Methane Emissions Reduction Program: Oil and Gas Methane Monitoring and Mitigation Grant Methane Emissions Reduction Program: Methane Mitigation Technologies Grant
Geographic Scope
Statewide
Authority to Implement
Subject to further legal review: - NJDEP's Greenhouse Gas Monitoring and Reporting Rule derives statutory authority from N.J.S.A. 13:1B-3(e), 13:1D-9, 26:2C-1 et seq., and 26:2C-37 et seq., particularly, 26:2C-41. The GHGMRR requires natural gas providers report leak detection equipment/methods that exceed Federal requirements. - The NJBPU and energy utilities have the authority to approve projects to reinforce and replace natural gas T&D infrastructure (N.J.A.C. 14:3-2A.1 et seq.). - NJDEP would need to obtain the authority to implement a declining cap on natural gas T&D emissions.
Metrics for Tracking Progress

As a requirement of the GHGMRR, New Jersey will continue to track natural gas main and service line leaks and replacements as one metric for evaluating the success of implementing this measure.

Emissions Reduction Measure 2: Stop the expansion of natural gas T&D infrastructure and introduce non-pipeline alternatives

As the State accelerates its efforts toward achieving its clean energy goals, there will be less dependency on natural gas infrastructure, calling for reconsideration of future construction and a transition towards non-pipeline solutions. Non-pipeline alternatives (NPA) can reduce GHG emissions by transitioning to electrified equipment or low-carbon fuel alternatives. Considering New Jersey's natural gas distribution system has grown by 316 miles of main and 17,342 service lines between 2020 and 2022, and a 2022 gas capacity report by London Economics International LLC. found that the State has sufficient natural gas pipeline infrastructure to meet the State's firm demand, there is a need to address the continued expansion of natural gas T&D infrastructure throughout the State (London Economics International LLC, 2021; United States Department of Transportation, 2025).

In recent years, the NJBPU has been undergoing grid modernization efforts, pursuant to EO 317, to evaluate the role of distributed energy resources, grid upgrades, and policy revisions in modernizing electric and natural gas T&D infrastructure. In 2023, the NJBPU proposed initial rules for grid modernization and held a technical conference on the future of natural gas. As the State awaits a report on the role and future of natural gas T&D infrastructure as an outcome of these proceedings, it has already begun exploring and introducing non-pipeline solutions in the interim.

One example of a notable NPA is thermal energy networks (TENs), which provide heating and cooling to multiple buildings via heat transfers through a series of connected pipes. TENs serve as a promising NPA solution since they are a parallel substitution strategy for replacing aging gas infrastructure, resulting in continued business for LDCs that allows for the monetization of thermal exchange and the facilitation of market transformation towards energy efficient products. TENs can utilize existing natural gas T&D infrastructure by connecting to multiple buildings within a neighborhood or geographic region. By using the heat from the earth's ground temperature or waste heat from large buildings, wastewater treatment plants, or data centers, TENs allow for an efficient exchange of heat that eliminates the need for fossil fuels.

Another NPA example involves hydrogen, yet the inclusion of hydrogen as a solution requires caution as the State considers the elimination and phase down of current natural gas T&D infrastructure. In October 2021, New Jersey Resources Corporation launched the State's first green hydrogen pilot project in Howell (New Jersey Resources, 2021). The project uses electricity generated from a nearby solar facility to power a 175kW electrolyzer that produces 65 kg of hydrogen per day, which is then blended into the utility's distribution pipeline to heat customer homes and businesses. The New Jersey Hydrogen Fuel Cell Report notes that the system offsets 180 short tons of CO₂ per year (Clean Energy and Sustainability Analytics Center, 2023). According to the USEPA Greenhouse Gas Equivalency Calculator, that is equal to the energy that about 22 homes would use in one year (USEPA, 2024b).

If the State were to pursue more NPAs instead of expanding natural gas T&D infrastructure, the State would need to enhance its coordination efforts across State agencies, advance its research and development initiatives into NPA solutions, work directly with the LDCs to advance their market transformation for low-and-moderate income customers and overburdened communities at a faster and smoother pace, and develop tools and resources for suitable alternatives to natural gas infrastructure developments. The State is exploring hydrogen as a source for lower carbon energy and energy storage through efforts such as NJEDA's Hydrogen Demonstration Project MOU with Rutgers University, funded by up to \$13 million of Regional Greenhouse Gas Initiative (RGGI) funds, to pilot hydrogen fuel cell trucks and their infrastructure at Port Newark and Port Elizabeth Marine Terminals (NJEDA, 2025a). Although entities within New Jersey continue to pursue clean hydrogen, particularly green hydrogen that derives power from renewable sources, New Jersey needs other NPA solutions.

Measure Quantification

The CCAP Policy Scenario stops the expansion of natural gas T&D infrastructure and introduces NPAs that could eliminate the need for new pipelines, avoiding future emissions. Compared to the emissions benefits from the Current Policy Scenario, emissions from Measure 2 are projected to result in emission reductions of 0.2 MMT CO₂e in 2030, 0.5 MMT CO₂e in 2040, and 0.5 MMT CO₂e in 2050 (Figure 6.2.10). Cumulative emissions are expected to decrease by 0.8 MMT CO₂e in 2030, 4.6 MMT CO₂e in 2040, and 9.7 MMT CO₂e in 2050 (Figure 6.2.11).

Figure 6.2.10. Annual emissions reductions from Measure 2, Stop the expansion of natural gas T&D infrastructure and introduce non-pipeline alternatives, compared to current policies.

Annual emission reductions in the Natural Gas T&D Sector are predicted to total 0.5 MMT CO₂e by 2050 under the CCAP Scenario when compared to the Current Policy Scenario.

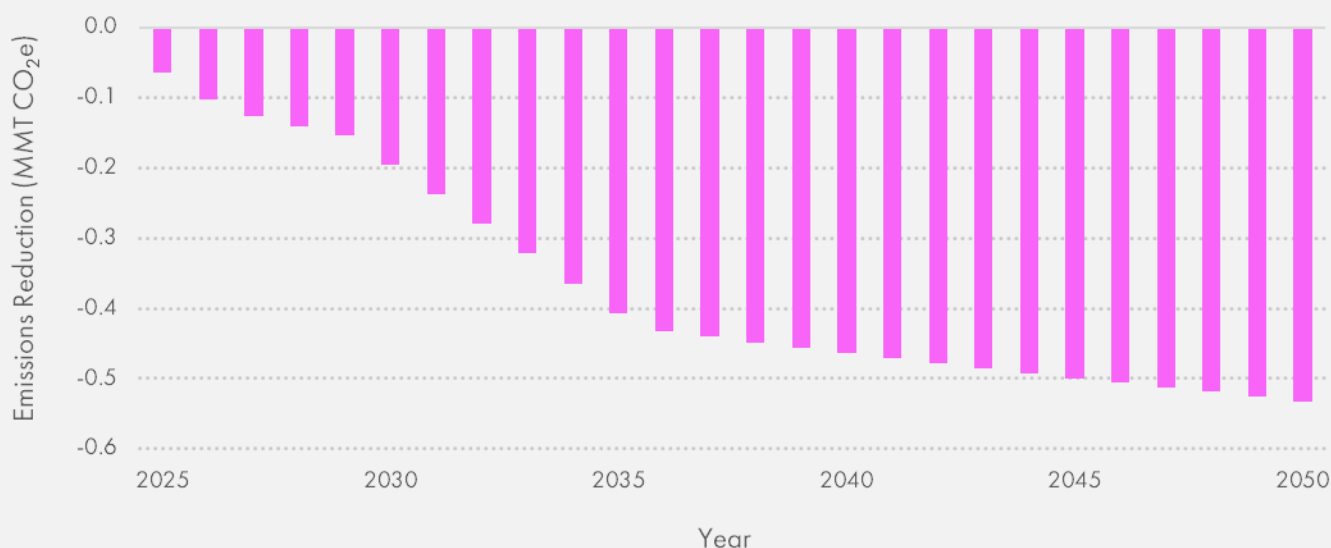
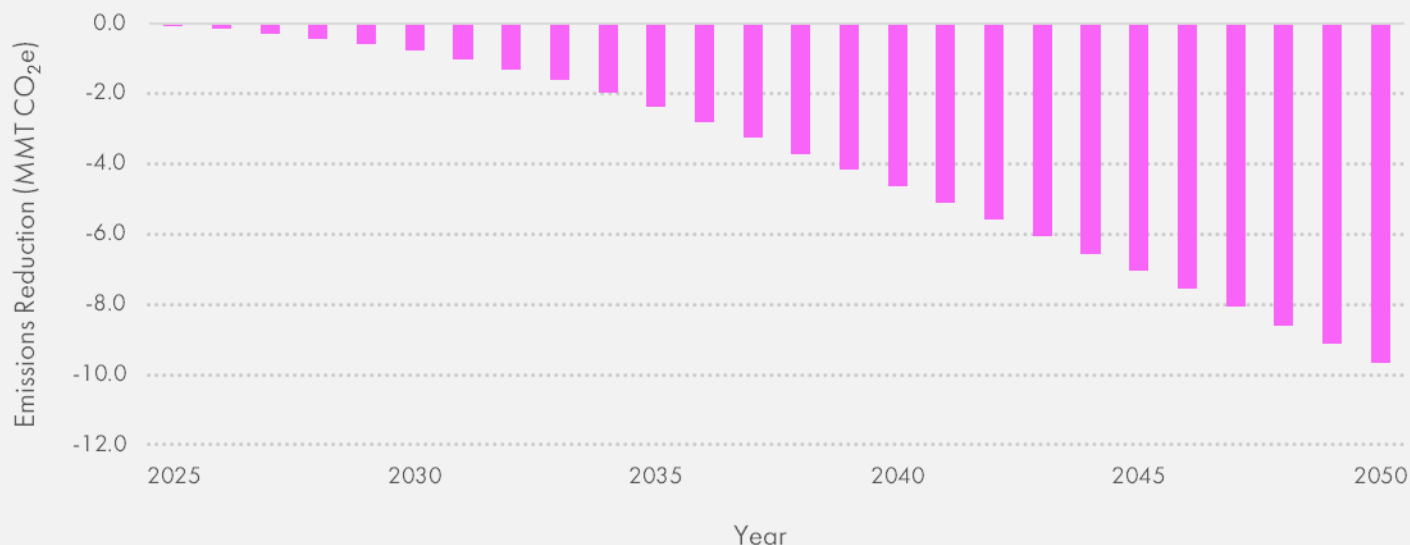


Figure 6.2.11. Cumulative emissions reductions from Measure 2, Stop the expansion of natural gas T&D infrastructure and introduce non-pipeline alternatives, compared to current policies.

Cumulative emission reductions in the Natural Gas T&D Sector are predicted to total 9.7 MMT CO₂e by 2050 under the CCAP Scenario when compared to the Current Policy Scenario.



Priority Enabling Actions

NJDEP has identified seven critical actions necessary to stop the expansion of natural gas T&D infrastructure and introduce NPAs.

Enabling Action 2.1 Coordinate integrated natural gas T&D infrastructure planning across multiple sectors

To effectively decarbonize New Jersey's natural gas T&D sector, the State must coordinate integrated planning across multiple sectors. This coordination includes integrated planning with the decarbonization of the power generation sector and buildout of local electric T&D systems to meet the anticipated increase in electricity throughout the State. Strategic downsizing of the natural gas system, combined with strategies described elsewhere in this report, will be used to leverage existing, emerging, and new technology to rapidly reduce and eventually eliminate the need for natural gas in New Jersey while also considering the most vulnerable gas customers and facilitating their transition first.

Enabling Action 2.2 Avoid further investments in natural gas T&D infrastructure

The State must take a balanced approach that delivers system-wide emission reductions while avoiding investments in stranded assets and exacerbating the existing gas infrastructure fund, especially as New Jersey transitions away from its dependency on natural gas and as current customers move to energy efficiency. As an alternative to current practices, the State should consider transitioning its investments from natural gas T&D infrastructure to NPA research, demonstration projects, incentives, and other market development needs. One opportunity to achieve this is through LDC's infrastructure improvement and advancement programs, which are five-year investment plans into natural gas T&D infrastructure. The NJBPU can revise the frameworks for LDC's infrastructure plan investments to avoid further investments in natural gas T&D infrastructure and deploy more NPAs.

Enabling Action 2.3 Consider low-carbon fuels as an alternative to natural gas

While there may be a strategic role for the natural gas system to transport low-carbon fuels, additional analysis is needed to determine their feasibility and climate impact when compared to introducing other alternatives, such as TENs. The analysis should include an evaluation of the full life cycle GHG and co-pollutant emissions impacts, health impacts, impacts on energy affordability, and safety and reliability considerations prior to investments in alternative fuels for use in gas system planning and credit generation in a Clean Heat Standard.

Enabling Action 2.4 Conduct feasibility studies of non-pipeline solutions

To better tackle the natural gas sector's emissions, the State should develop and conduct a series of studies involving non pipeline solutions. As discussed in the Residential and Commercial Buildings Chapter, the NJBPU is currently evaluating the feasibility of thermal energy networks in New Jersey, with a report expected by the end of 2025. Conducting similar studies for other NPAs and their applicability to lowering the State's natural gas T&D emissions are necessary as New Jersey considers the role of natural gas infrastructure in its electrification plans.

Enabling Action 2.5 Implement incentives to convert portions of the natural gas systems to thermal energy networks

Depending on the outcome of the NJBPU's feasibility study of introducing TENs across the State, there is potential for implementing incentives to convert portions of the natural gas T&D systems towards cleaner sources of heating and cooling. The State should begin encouraging LDCs to convert natural gas systems to TENs, and consider the role of financial incentives, tax credits, or other means to advance its efforts.

Enabling Action 2.6 Evaluate the role of legislation to encourage zonal electrification

Introducing TENs and other zonal electrification tactics are best done prior to when the construction starts, since it can become more complex when introduced to already built regions. Given this consideration, the State should explore the role of legislation, or policies that allow municipalities and utilities to advance regional electrification strategies to newly built and existing buildings. However, where large loads can be deferred, or where the State has the opportunity to free up capacity via electrification (i.e., the energy efficiency transition), TENs and other zonal electrification tactics would be ideal for retrofitting.

Enabling Action 2.7 Develop gas system planning tools, like system pruning or zonal electrification tools

With the phase down of natural gas T&D infrastructure developments, tools and other planning resources become an essential component for energy utility preparedness. Gas system planning tools, like system pruning or zonal electrification tools, can help determine the feasibility, effectiveness, and placement of NPAs within the current market. One example is California's Pacific Gas and Electric *Geospatial Electrification Tool*, which pinpoints and evaluates potential locations for electrification as the State aims to retire 31,000 feet of existing pipelines and convert impacted buildings to electricity via its *Zonal Electrification Pilot Project* (Pacific Gas & Electric Company, 2022; Pacific Gas & Electric Company, n.d.). As such, New Jersey should look to other State's tools for gas system planning, and either adopt or develop tools applicable to the State's natural gas T&D initiatives.

Table 6.2.6. Measure 2 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Coordinate integrated natural gas T&D infrastructure planning across multiple sectors	Ongoing	All State Agencies
Avoid further investments in natural gas T&D infrastructure	Ongoing	Legislature, NJBPU, Energy Utilities
Consider low-carbon fuels as an alternative to natural gas	Near-Term	NJBPU, Energy Utilities
Conduct feasibility studies of non-pipeline solutions	Near-Term	NJBPU, Energy Utilities
Implement incentives to convert portions of the natural gas systems to thermal energy networks	Near-Term	NJBPU, Energy Utilities
Evaluate the role of legislation to encourage zonal electrification	Near-Term	Legislature, NJBPU
Develop gas system planning tools, like system pruning or zonal electrification tools	Near-Term	NJDEP, NJBPU, Energy Utilities

Table 6.2.7. Measure 2 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
Medium-High
Secured Funding
New Jersey has used RGGI auction proceeds to fund the NJ Green Bank, geothermal feasibility studies and other natural gas heating, ventilation and air conditioning (HVAC) replacements with efficient heat pumps. Capital improvements to natural gas T&D infrastructure are subject to cost recovery regulations that allow the utilities to pass those costs on to their consumers through rate increases.
Funding gaps + opportunities
The enabling actions described in this measure would eventually save the State money from not replacing or repairing aging pipeline infrastructure and can benefit from additional funds to deploy these initiatives. Currently the funds from the first two programs listed below are expended, but the State should track future funding availability.
Methane Emissions Reduction Program: Oil and Gas Methane Monitoring and Mitigation Grant Methane Emissions Reduction Program: Methane Mitigation Technologies Grant Spurring Projects to Advance Energy Research and Knowledge Swiftly (SPARKS)
Geographic Scope
Statewide

Authority to Implement

Subject to further legal review:

- The NJBPU and energy utilities have the authority to phase down investments in natural gas T&D infrastructure and introduce NPAs (EO 317, 2023; N.J.A.C. 14:8-5, 2019; P.L. 2018, c.17, 2018).
- The NJDEP has broad authority to implement some of the enabling actions in this measure (N.J.S.A. 26:2C-41, 1954; N.J.A.C. 7:27-21, 2022; N.J.A.C. 7:27E, 2022).

Metrics for Tracking Progress

As a requirement of the GHGMRR, New Jersey will continue to track natural gas main and service line leaks and replacements as one metric for evaluating the success of implementing this measure. Additional metrics involving NPAs include dedicated funds by LDCs, the number and type of NPAs implemented, associated costs, and the customers being served by the NPA.

STAKEHOLDER FEEDBACK

The NJDEP and other State agencies requested stakeholder feedback on the topics discussed in this Comprehensive Climate Action Plan, where the outcomes were used to inform the emission reduction measures detailed in this report.

With particular focus on natural gas, stakeholders expressed opposition to using the energy source to meet the State's clean energy and emissions goals, with one raising concern about a new natural gas pipeline being installed in the South Brunswick area. The public indicated the need for infrastructure upgrades as the State aims to advance cleaner energy to the grid, and pinpointed South Jersey as a targeted region to prioritize transmission modernization and ensure equitable access. Notably, environmental justice advocates suggested the State:

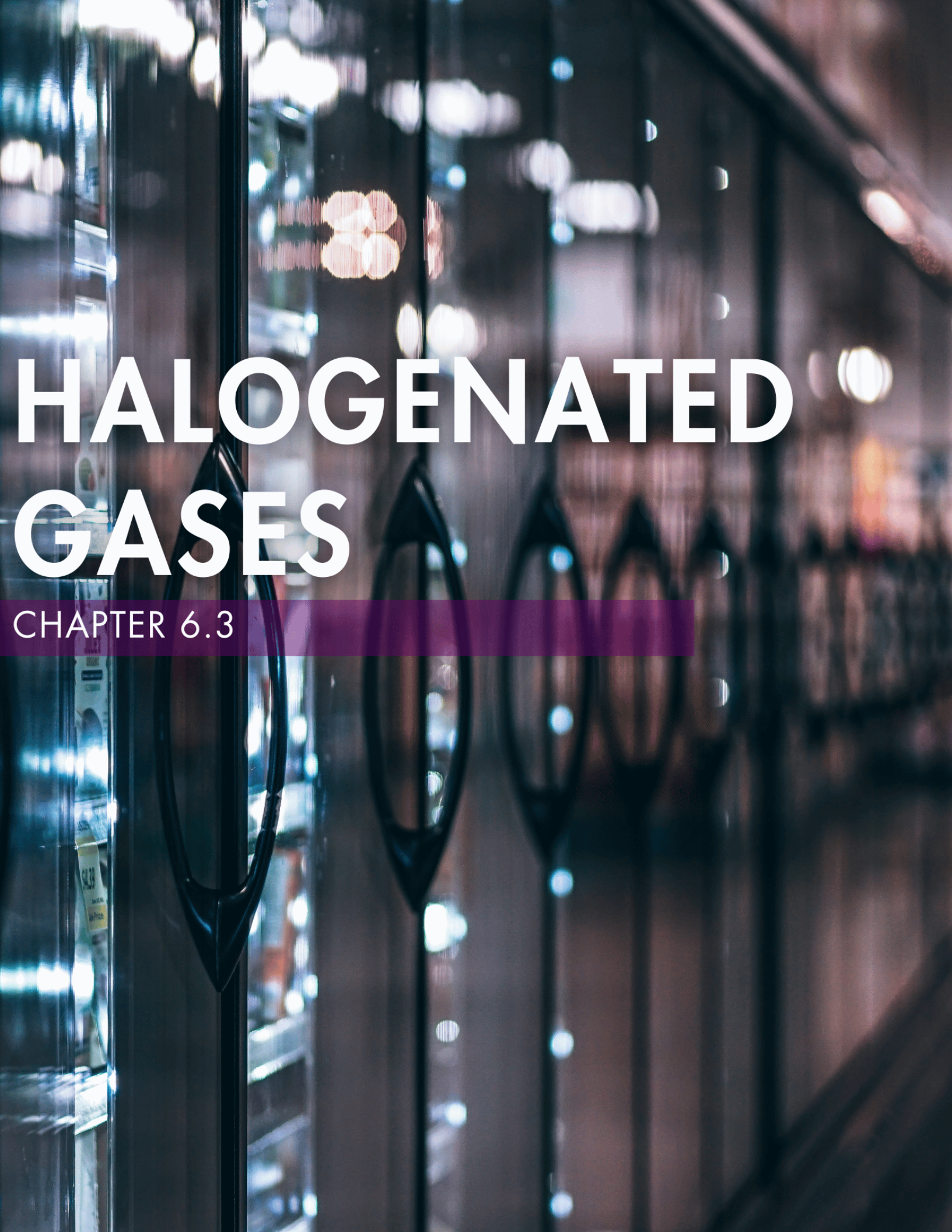


"Pursue a process of informed, pre-consent for technological investments, ensuring communities are aware of the costs, health impacts, and infrastructure implications." - Participant in the Central and South Jersey Climate Action Community Dialogue in

June 2025



Further stakeholder feedback involved the need to transition away from natural gas and toward cleaner energy from solar and wind, as discussed in more detail in the Electricity Generation and Demand Chapter.



HALOGENATED GASES

CHAPTER 6.3

OVERVIEW

The Halogenated Gases sector includes organic compounds that incorporate a halogen such as fluorine, chlorine, bromine or iodine. The category includes a broad range of climate pollutants including chlorofluorocarbons (CFCs), hydrochlorofluorocarbons (HCFCs), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), and other gases such as sulfur hexafluoride (SF₆). Fluorinated gases are also sometimes referred to as F-gases. Because the Kyoto Agreement is limited to seven specific gases, national inventories focus on those climate pollutants. The term “halogenated gases” as used in this chapter refers only to HFCs and PFCs unless otherwise noted. Sulfur hexafluoride is also discussed in this chapter as a fluorinated species. That said, other pollutants, such as CFCs and HCFCs also play a role in climate change.

HFCs are the fastest growing source of greenhouse gases globally (United Nations Environment Programme, 2024), and this growth has been mirrored in New Jersey. This is due to the prevalent use of HFCs in air conditioning, heat pumps and refrigerants as a replacement for ozone depleting substances (ODS) such as chlorofluorocarbons (e.g., R-12) and hydrochlorofluorocarbons (e.g., R-21).¹¹ Consistent with the 1987 Montreal Protocol, ODS will be completely phased out of production in the United States by 2030, which has spurred an increase in the usage of high-GWP HFCs. That being said, under the USEPA’s American Innovation and Manufacturing (AIM) Act regulations, high-GWP HFC emissions will be reduced 85% by 2050.

Most HFCs are considered short-lived climate pollutants with high global warming potentials¹² (GWP) compared to carbon dioxide (CO₂). As a result, they are included in this chapter as highly warming climate pollutants. For example, R-410a has a global warming potential 2,300 times greater than CO₂ based on a 100-year global warming potential (GWP₁₀₀), or 4,700 times greater based on a 20-year global warming potential (GWP₂₀)¹³

HFC compounds are currently used in industrial, commercial, and residential refrigerants, firefighting agents, propellants, and other applications. With refrigeration, cooling, and heating being the primary uses of HFCs in New Jersey, coordination of efforts across sectors is essential. For example, electrification of heating and cooling with heat pumps will support the transition from fossil fuels to renewable energy in the residential and commercial sectors. Given the lifespan of heat pumps and air conditioning equipment, simultaneously phasing out the high GWP HFC refrigerants used in this equipment is crucial. Programs to recapture, recycle and properly dispose of HFCs from retired equipment must be in place to avoid the negative climate impacts of their release. Also, programs to support facilities to switch from the use of high-GWP refrigerants to low-GWP refrigerants can be crucial for further reducing GHG emissions from the refrigerants’ use.

¹¹ Refrigerants are represented by the letter “R” (as in “refrigerants”) followed by a two- or three-digit number and, in some cases, one or two letters.

¹² The global warming potential was developed to allow comparisons of the global warming impacts of different gases. It is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of carbon dioxide.

¹³ Based on GWP values from IPCC (2021).

WHERE WE STAND

In 2022, emissions from halogenated gases¹⁴ contributed 5.1 million metric tons (MMT) of carbon dioxide equivalent (CO₂e) to New Jersey’s gross total emissions of 107.5 MMT CO₂e emissions, based on GWP₁₀₀¹⁵. HFCs accounted for all but 0.1 MMT CO₂e under both GWP₁₀₀ and GWP₂₀, with this 0.1 MMT CO₂e being sulfur hexafluoride (SF₆). Table 6.3.1 provides a breakdown of emissions from halogenated gases, their associated end-use activities, and their status in New Jersey’s emissions inventory. HFC emissions vary depending on the application and the handling policies in place for their end-of-life handling (Figure 6.3.1).

In 2022, Halogenated Gases were estimated to release 5.1 million metric tons of CO₂e based on GWP100, or 11.5 million metric tons of CO₂e based on GWP20.

Table 6.3.1. Breakdown of emissions from highly warming gases, end-use activities, and status in New Jersey’s emissions inventory.
Halogenated gases are used in a variety of applications, most notably for cooling and refrigeration.

Halogenated Gas Category	Emission activity/end-use	Status in New Jersey Emissions Inventory 2022
Hydrofluorocarbons (HFCs)	Primarily used for cooling and refrigeration; replacement for ozone depleting substances.	5.0 MMT CO ₂ e (GWP ₁₀₀), or 11.5 MMT CO ₂ e (GWP ₂₀)
Perfluorocarbons (PFCs)	Cleaning solvents in the semi-conductor industry.	No longer an issue with no reported emissions in recent years.
Sulfur hexafluoride (SF ₆)	Specialized use as an insulating fluid in high voltage electrical equipment.	0.1 MMT CO ₂ e (GWP ₁₀₀ or GWP ₂₀).
Nitrogen trifluoride (NF ₃)	Cleaning gas in semi-conductor manufacturing as well as etchant for certain materials.	No reported emissions from relevant sector (semi-conductor industries).
Chlorofluorocarbons (CFCs)	Used in manufacture of aerosol sprays, blowing agents for foam, as solvents, and as refrigerants. Ozone depleting substance controlled under the Montreal Protocol.	Manufacturing has already been phased out. Legacy equipment is being replaced upon retirement. (Minimal CFC usage reported in 2023 from facilities in NJ using large refrigeration systems with high-GWP refrigerants and subject to the GHGMR rule)
Hydrochlorofluorocarbons (HCFCs)	Replacement for CFCs in refrigeration and air-conditioning, aerosol propellants, and foam manufacture.	Being phased out. (Minimal HCFC usage reported in 2023 from facilities in NJ using large refrigeration systems with high-GWP refrigerants and subject to the GHGMR rule.)

¹⁴ Including sulfur hexafluoride.
¹⁵ 11.5 MMT CO₂e of the gross total of 134.9 MMT CO₂e based on GWP20.

NJDEP analyzed a subset of HFC emissions: the large refrigeration systems and chillers in New Jersey which report to the State under the GHGMRR.¹⁶ In 2023 these systems used the refrigerants R-404A, R-407A, and R-134a. These refrigerants' 100-year GWPs range from 1,430 to 3,920¹⁷. This is a significant concern. R-22 was in use at 160 of 858 facilities that submitted reports to New Jersey under the GHGMRR in 2023.¹⁸ R-22 refrigerant, also known as Freon, is an air conditioning refrigerant and an ozone-depleting product, and it has a high global warming potential of 1,810 (GWP₁₀₀)¹⁹ (NYSDEC). In 2004, USEPA began phasing out R-22 with the expectation that it would be completely eliminated by the year 2030. R-410A, commonly known as Puron, has become the common replacement for Freon despite its high GWP. Requiring sales of new appliances that use low global warming substitutes will avoid increased stores of high-GWP HFCs that could potentially be released in the lifecycle of equipment.

Climate-safer, low-GWP alternative refrigerants are emerging, some of which are already available on the market from major manufacturers. For example, CO₂ and hydrocarbons such as propane are natural refrigerants that can be used as a substitute for high-GWP HFCs and other high-GWP synthetic refrigerants in use today (Igusky, 2015). Natural refrigerants, though, must be managed for their more difficult properties. Ammonia has higher toxicity, CO₂ requires high pressures in refrigeration equipment, and propane has higher flammability. Lower GWP options such as hydrofluoroolefins (HFOs) are also available, for example, the HFO R-514A, which has a very low GWP of 2 (GWP₁₀₀). HFOs also have higher flammability, though.

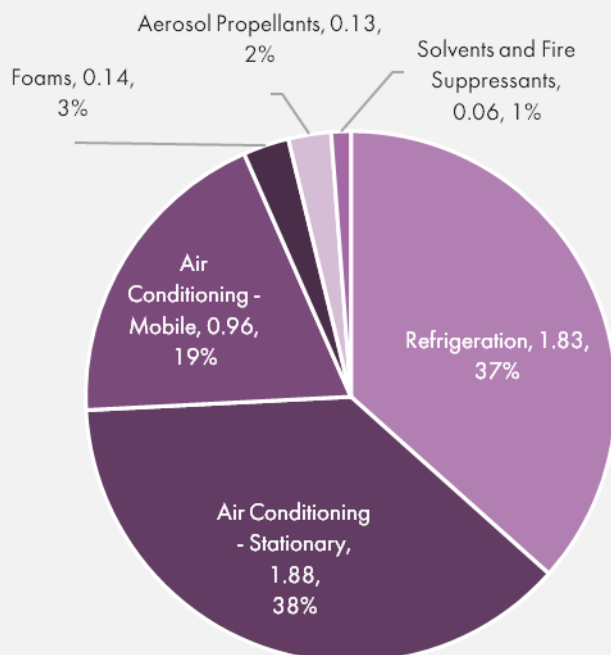
In addition to replacement of high-GWP refrigerants with low-GWP refrigerants, managing refrigerant material throughout the lifecycle of equipment is necessary to control releases to the atmosphere. Emissions are prone to occur during the installation, servicing and disposal of equipment. Refrigeration leaks comprise up to 35% of the State's estimated overall halogenated gases emissions. (NJDEP, 2021). As shown in Table 6.3.2, halogenated gas emissions in New Jersey more than doubled from 2005 to 2022, while the same time period saw a 50% national increase in halogenated gases but a 62% national decrease in SF₆ (NJDEP, 2025; USEPA, 2025c).

Table 6.3.2. Annual Halogenated Gas (including SF₆) Greenhouse Gas Emissions 2005-2022 (MMT CO₂e).

	2005	2006	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
GWP ₁₀₀	2.4	2.6	4.0	4.2	4.5	4.7	4.9	5.1	5.4	5.4	5.3	5.1
GWP ₂₀	5.4	5.8	8.8	9.4	9.9	10.5	11.0	11.4	12.0	12.1	11.8	11.5

Historical growth of refrigerant emissions has been driven by the transition from ODS to non-ODS used in refrigerant equipment and the growing use of refrigeration and air conditioning. From 2005 to 2020, the number of U.S. households grew by 13%. (U.S. Census Bureau, 2024). During the same time period, U.S. households primarily using

Figure 6.3.1. Percentage of HFC Emissions by End Use in 2022 (MMT CO₂e).
Refrigeration and air conditioning represent the greatest sources of HFC emissions.



¹⁶ Entities reporting refrigerant usage through the GHGMRR represent a fraction of the refrigerant systems in New Jersey which use HFCs.

¹⁷ Their 20-year GWPs range from 4,140 to 7,208.

¹⁸ This included all the facilities that submitted reports for calendar year 2023 where they did not subsequently terminate their reports or registration, their emissions calculation did not return a negative value or error, and their reported 2023 amount of refrigerant stored was consistent with their other refrigerant data submissions.

¹⁹ 5,690 (GWP₂₀)

heat pumps for space heating rose from 8% to 14% (Strauss, 2023). While heat pump usage for space heating is expected to grow in New Jersey, it is expected to be lower than the percentage range just cited, as the southern U.S. accounted for 80% of the households using heat pumps in 2020 while the Northeast and Midwest combined accounted for just 6%.²⁰ However, New Jersey intends to continue to adopt policies to bolster heat pump adoption, as outlined in the Buildings Chapter of this report.

Additionally, the growth of industries and commercial enterprises that require air conditioning and refrigeration contributed to increased HFC usage. New Jersey has experienced growth in data processing and data centers (212%), food services (10%), and warehousing and storage (125%) which all have large cooling requirements (U.S. Bureau of Economic Analysis, 2020). That being said, New Jersey's 2022 emissions estimate of 5.1 MMT CO₂e (GWP₁₀₀) is showing the effects of policies to reduce emissions, with emissions leveling off.

Business-as-Usual Scenario

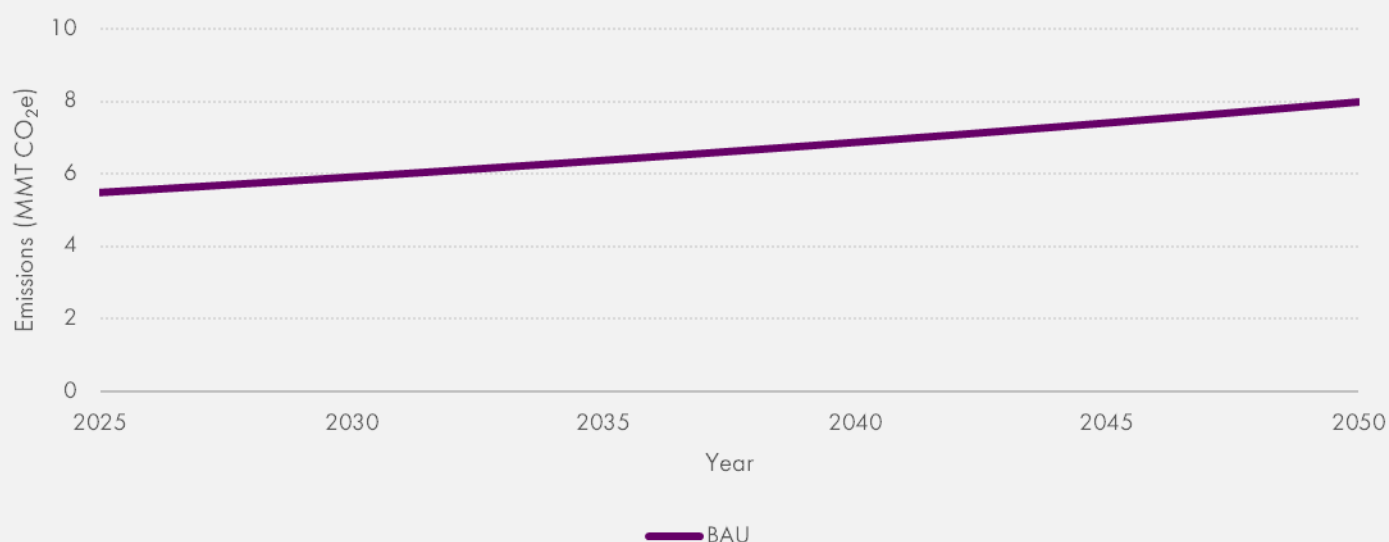
A Business-as-Usual (BAU) projection estimates future emissions if current trends continue and no actions are taken. It serves as a baseline for comparing the effects of new policies or changes. This helps decision-makers understand the impact of different choices and plan more effectively. For the purposes of this chapter the BAU projection²¹ assumes the following circumstances:

- No emission reduction measures are implemented. USEPA's AIM Act regulations and NJ SNAP Law are not implemented;
- Expanded use of HFCs and PFCs is driven by the natural growth of the economy; and
- Refrigerant technology ceases to advance, with replacement equipment having features identical to those in place when the BAU scenario begins.

If New Jersey stays on a BAU path, emissions from the Halogenated Gases sector will gradually rise to 8.1 MMT CO₂e in 2050 (Figure 6.3.2).

Figure 6.3.2. Halogenated Gases Sector 2020-2050 Business-as-Usual Projection (MMT CO₂e).

Allowing highly warming halogenated gases' usage to expand without planned phaseouts or refrigerant management policies would result in increased emissions.



²⁰ Ibid.

²¹ This projection includes only HFCs and PFCs, as these gases are required in GHG inventories because they are among the seven gases listed under the Kyoto Protocol.

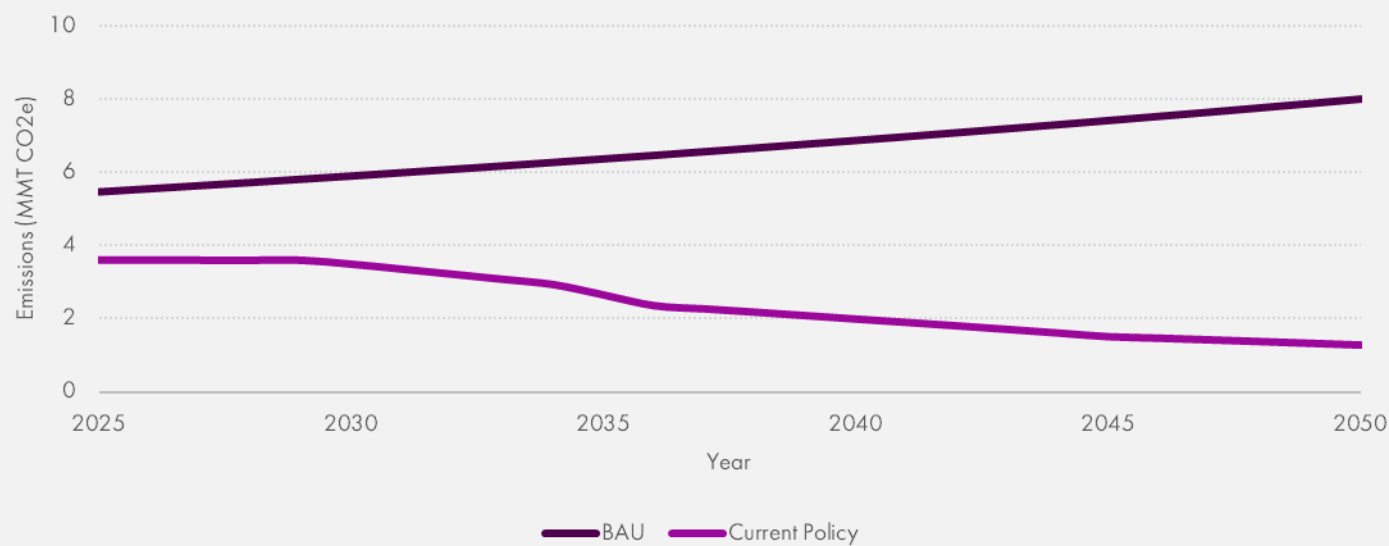
Current Policy Scenario

The Current Policy Scenario reflects the projected outcomes based on existing policies and their anticipated continuation. This serves as a benchmark or progress report for the impact of policies currently on the books. For the purposes of this chapter, the Current Policy Scenario projection assumes the following:

- Implementation of USEPA’s American Innovation and Manufacturing (AIM) Act regulations, 85% reduction in high-GWP HFC emissions by 2050.

Under these conditions, GHG emissions from halogenated gases are expected to fall to 1.3 MMT CO₂e by 2050 (Figure 6.3.3).

Figure 6.3.3. Halogenated Gases, under Current Policy and BAU Conditions (MMT CO₂e).
Implementation of the AIM Act is critical to realizing significant emissions reductions in this sector.



Critical Emission Reduction Policies Adopted Since 2020²²

New Jersey’s existing emissions reduction efforts in this sector consists of laws, rules, and incentives seeking to reduce halogenated gas emissions.

New Jersey Significant New Alternatives Policy Law

The U.S. Environmental Protection Agency adopted the Significant New Alternatives Policy (SNAP) program rules 20 (USEPA, 2020a) and 21 (USEPA, 2016) in 2015 and 2016, respectively. In part, these rules set a schedule to phase down the use of certain HFCs that had previously been listed as acceptable substitutes for ODS in refrigeration and air conditioning equipment, foam, and aerosol propellants. The U.S. Court of Appeals vacated certain portions of the SNAP program in 2017, and then USEPA took various actions to further roll back the SNAP rules.

In response to these actions, New Jersey and other states enacted state legislation to retain the phaseout of highly warming HFCs. New Jersey’s legislation, Public Law 2019, c.507, prohibits the use of HFCs, or other similar substances, in all new equipment or products for sale, lease, rent, or to be installed or entered into commerce in the State according to the timeframe established in the legislation (Table 6.3.3). Additionally, the legislation prescribes requirements for persons who install, repair, maintain, service, replace, recycle or dispose of stationary refrigeration or air conditioning

²² Refer to the 80x50 GWRA report for a summary of relevant policies prior to 2020 (NJDEP, 2020).

appliances. The legislation additionally authorizes the NJDEP to adopt rules and regulations to further regulate HFC use in the State.

Table 6.3.3. Summary of HFC Phase Down Schedule per P.L. 2019 c.507.

Current New Jersey law will phase out the use of specified highly warming HFCs in new equipment and products as listed below.

Effective Date for Restrictions	Applicable Materials
July 1, 2020	Propellants; rigid polyurethane applications and spray foam, flexible polyurethane, integral skin polyurethane, flexible polyurethane foam, polystyrene extruded sheet, polyolefin, and phenolic insulation board and bunstock; and supermarket systems, remote condensing units, stand-alone units, and for all other applications and end uses for substitutes not covered elsewhere in this table;
January 1, 2021	Refrigerated food processing and dispensing equipment; compact residential consumer refrigeration products; and polystyrene extruded boardstock and billet, and rigid polyurethane low-pressure two component spray foam;
January 1, 2022	Residential consumer refrigeration products, other than compact and built-in residential consumer refrigeration products, vending machines;
January 1, 2023	Cold storage warehouses; and built-in residential consumer refrigeration products; and
January 1, 2024	Centrifugal chillers and positive displacement chillers.

In 2023, New Jersey enacted an amendment to the above law, specifically, P.L. 2023, c. 178. As amended, the law makes clarifications concerning the use of certain HFCs in building and manufacturing processes. It allows manufacturers who use HFCs in their products to begin a phasedown of their use based on the federal guidelines, while implementing changes, as needed, to their choice of refrigerants, to reduce GHG emissions. This law provides that any refrigerant listed as acceptable by USEPA under the SNAP program (42 U.S.C. s.7671k) is not to be prohibited under the "State Uniform Construction Code Act," P.L. 1975, c.217 (C.52:27D-119 et seq.), or local code. This is true provided that any equipment using the refrigerant is listed and installed in accordance with USEPA's safety standards and use conditions. (New Jersey Assembly, 2023).

This amendment enables the use of lower GWP refrigerants such as those classified as A2Ls, some of which are HFCs and some of which are other types of refrigerants such as HFOs. The International Code Council (ICC), with its 2024 International Codes, now allows for the use of A2L refrigerants (ASPE Pipeline, 2022), and states such as New Jersey are adopting the 2024 International Codes in 2026 to permit the use of A2L refrigerants. These refrigerants are considered mildly flammable, but they are characterized as having anywhere from slightly lower to significantly lower GWPs than older A1 refrigerants, some of which are also HFCs.

In addition, in recent years, USEPA has adopted additional SNAP rules, including at least one that lists acceptable use conditions for lower-GWP refrigerants. An example includes SNAP Rule 24, which lists HFO-1234yf as "acceptable with certain conditions on use" in motor vehicle air conditioning for certain newly manufactured nonroad vehicles. HFO-1234yf has a GWP₁₀₀ of 4 (Federal Register, 2022). Other SNAP rules have approved the use of some refrigerants with both higher and lower GWPs than other refrigerants with accepted use conditions. See for example SNAP Rule 25 (Federal Register, 2023).

Greenhouse Gas Monitoring and Reporting Rule

Effective in 2022, the NJDEP adopted the Greenhouse Gas Monitoring and Reporting Rule (GHGMRR) (N.J.A.C. 7:27E, 2022). In addition to required reporting of methane emissions from natural gas, the rule covers commercial and industrial facilities using a full charge of at least 50 pounds of a high-GWP refrigerant or blend where the GWP₁₀₀ is at least 150. These facilities are required to register with NJDEP and submit an annual report documenting the equipment and refrigerants they are using. This report includes the installation year and model of the equipment, and the quantity of each high-GWP refrigerant charged into all of the facility's equipment combined. NJDEP analyzes the reported data to estimate refrigerant emissions.

NJ Cool Program

NJ Cool is a pilot program that the New Jersey Economic Development Authority (NJEDA) started in 2023. The program supports the replacement of highly warming refrigerants during commercial, industrial, and institutional building retrofits to reduce greenhouse gas emissions, improve indoor and outdoor air quality, and reduce energy costs. The NJ Cool Program provides grants of \$50,000 to \$1 million to upgrade building heating and cooling systems to less polluting alternatives, as well as implementing other energy efficiency measures or installing on-site renewables. Grant-funded projects must be located in overburdened and adjacent census block groups in New Jersey. This is New Jersey's first incentive program encouraging the adoption of low-GWP refrigerants. It is funded with proceeds from the Regional Greenhouse Gas Initiative (RGGI). (NJEDA, 2025b)





THE PATH FORWARD

Halogenated gases are a unique sector in this report, as modeling indicates New Jersey will achieve its emissions reduction goal via implementation of the federal AIM Act (USEPA, 2021). The CCAP Scenario follows the same trajectory as the Current Policy Scenario (Figure 6.3.4). Therefore, the State’s efforts should focus on realizing full implementation of the USEPA regulations promulgated under the AIM Act (Table 6.3.4) and establishing programs and policies to help organizations comply with these regulations. Additionally, timelier phaseout of these highly warming gases will achieve immediate global warming benefits, slowing the rate of warming over the next few decades. Thus, targeting halogenated gases is a strategic approach to achieving both immediate and long-term climate goals, and to help the State realize early emission reductions.

Table 6.3.4. AIM Act Phasedown Schedule.

Year	Reduction in HFCs Production & Consumption Baseline
2020	10%
2024	40%
2029	70%
2034	80%
2036 & Beyond	85%

NJDEP has identified two measures that will be integral to realizing reductions in GHG emissions from the use of halogenated gases, including highly warming HCFCs and CFCs:

- **Measure 1:** Implement a refrigerant management program
- **Measure 2:** Implement a refrigerant replacement incentive program

Implementation of these measures will help to expand upon and backstop USEPA’s implementation of the AIM Act regulations and ensure the continued reduction of emissions from high-GWP refrigerants. They will likewise provide an opportunity for innovations in halogenated gas alternatives, development of the workforce and job creation, and significant cost savings to businesses from substantial reductions in refrigerant leakage. Collectively, implementing the above measures will accelerate reduction of emissions from the Halogenated Gases Sector toward the goal of 1.3 MMT CO₂e emissions by 2050.

2050 EMISSIONS SECTOR

1.3 MMT CO₂e

EMISSION ACTIVITIES

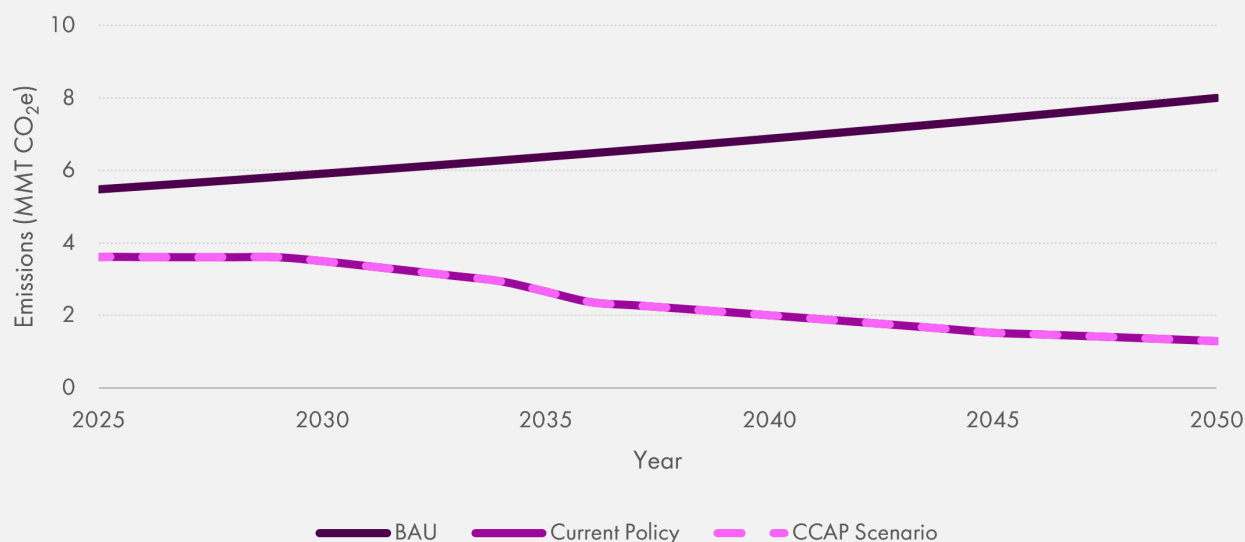
- Refrigeration
- Air Conditioning
- Foams
- Aerosols
- Solvents and Fire Suppressants

EMISSIONS REDUCTION MEASURES

1. Implement a refrigerant management program
2. Implement a refrigerant replacement incentive program

Figure 6.3.4. Halogenated Gas Sector CCAP Scenario (MMT CO₂e).

USEPA's AIM Act Phasedown regulations are critical for achieving the CCAP scenario and driving emissions in this sector down to 1.3 MMT CO₂e by 2050.



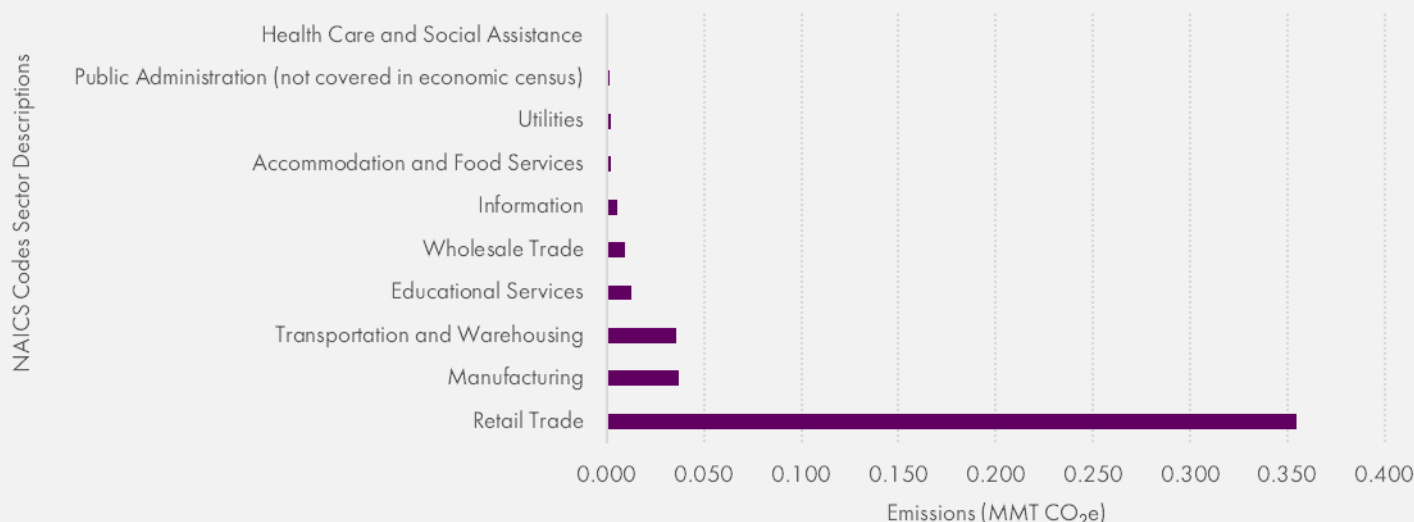
Emissions Reduction Measure 1: Implement a refrigerant management program

To reduce emissions of highly warming halogenated gas refrigerants from leaks and disposal from refrigeration equipment and chillers, the State should consider implementing a program that oversees facilities' recordkeeping, maintenance and repair in accordance with New Jersey law (P.L. 2019, c. 507, 2020). This program could require facilities with one or more chillers and/or refrigeration systems using 50 lbs or more of a high-GWP refrigerant (150 GWP or more) to conduct and report periodic leak inspections, promptly repair leaks, and adopt service practices to reduce emissions of refrigerants. Containment strategies help to reduce halogenated gas emissions in the short run. One-time emissions from the disposal of refrigerants, if unabated, can be as large as the year-long emissions from the use of refrigerants in leaking equipment.

In 2023, data from the GHGMRR indicated that large refrigerant systems in the State emitted 0.463 MMT CO₂e (Figure 6.3.5). Of these emissions, an estimated 66% were from the subsector "Supermarkets and Other Grocery Stores (except Convenience)," under the Retail Trade sector. The next highest subsectors were "Warehouse Clubs and Supercenters," accounting for an estimated 9%, and "Refrigerated Warehousing and Storage," accounting for an estimated 8% of 2023 emissions. A refrigerant management program targeted at these subsectors would particularly help to reduce the GHG emissions from refrigerant leakage and disposal.

Figure 6.3.5. Calculated Emissions by NAICS 2-Digit Code Description from 2023 Reports.

Facilities subject to the GHGMRR submitted these reports to NJDEP regarding their commercial and industrial refrigeration systems.



Measure Quantification

NJDEP estimates that implementation of a Refrigerant Management Program focused on the State's refrigeration sector would reduce emissions on average 0.028 MMT CO₂e annually (Figure 6.3.6), achieving a cumulative reduction of 0.805 MMT CO₂e by 2050 (Figure 6.3.7.). Sector emissions would total 4.93 MMT in 2030, 4.27 in 2040 and 4.19 MMT CO₂e by 2050.

Figure 6.3.6. Annual Emissions Reductions from Measure 1, Implementing a Refrigerant Management Program (MMT CO₂e).

The RMP is expected to reduce emissions across the refrigerant sector by an average of 0.028 MMT CO₂e annually, especially 2030-2040, the main years of the program.

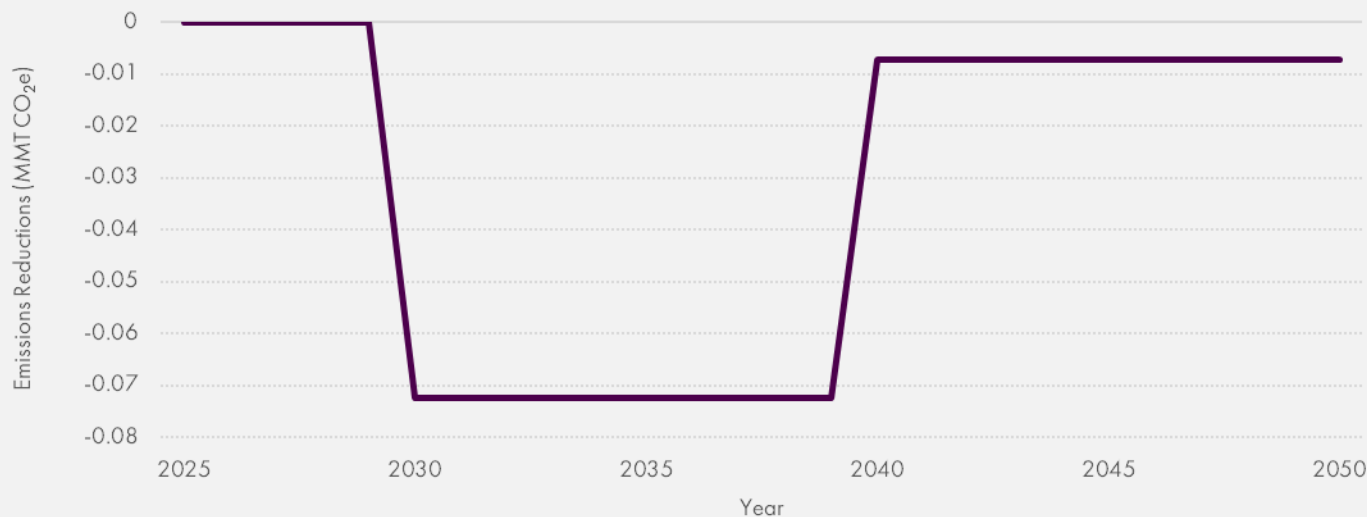
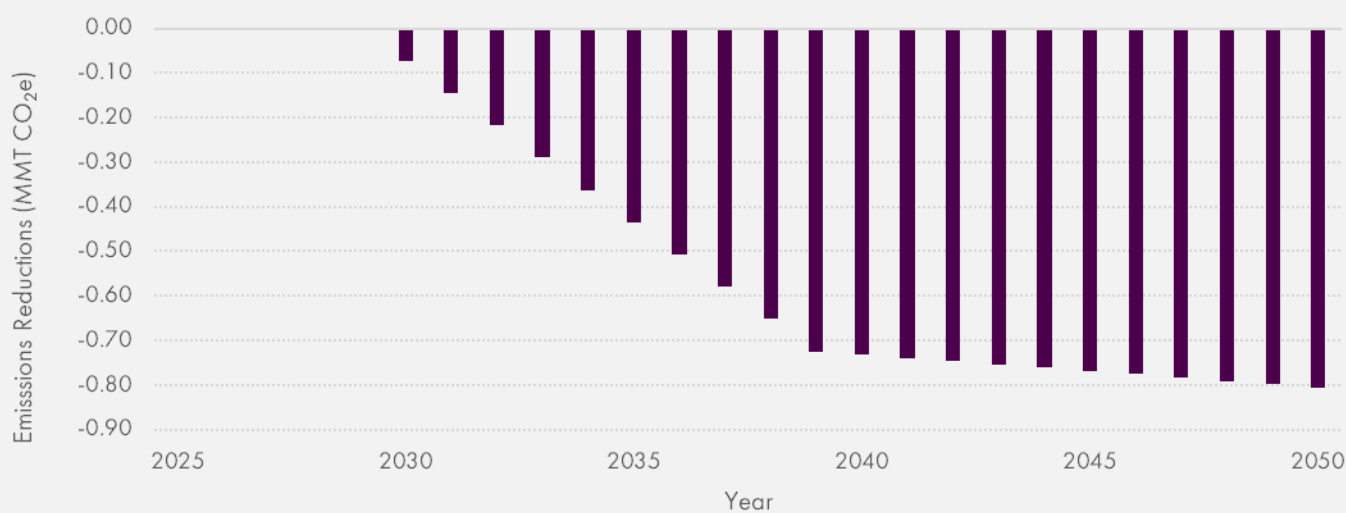


Figure 6.3.7. Cumulative Emissions Reductions from Measure 1, Implementing a Refrigerant Management Program (MMT CO₂e).

The RMP is expected to reduce emissions across the refrigerant sector by a total of 0.805 MMT CO₂e, from 2025 through 2050.



This measure quantification assumes that New Jersey's Refrigerant Management Program is modeled on the USEPA GreenChill program. The GreenChill Program is a voluntary partnership run by the USEPA that works with supermarkets and food retailers to reduce refrigerant emissions and decrease the environmental impact of refrigeration systems (USEPA, 2024). GreenChill corporate partners, whose facilities are implementing emissions reduction measures, report an average emissions rate of approximately 14% (USEPA, 2025d). This statistic represents an approximately 44%

reduction in refrigerant emissions from participation in the GreenChill program. The program includes the following components: “transitioning to environmentally friendly refrigerants, reducing the amount of refrigerant used by stores, eliminating refrigerant leaks, adopting green refrigeration technologies, and implementing environmental best practices” (USEPA, 2025d). At least several of these components would be part of a New Jersey refrigerant management program.

Priority Enabling Actions

NJDEP has identified three critical actions necessary to implement a refrigerant management program.

Enabling Action 1.1 *Convene stakeholders to inform Refrigerant Management Program*

Meaningful engagement and dialogue are critical to ensuring sound policy. State agencies should formulate a plan to convene external stakeholders in a stakeholder process to inform a future Refrigeration Management Program rule development. Key demographics to engage include industry groups, refrigerant manufacturing companies, equipment manufacturing companies, equipment technicians and environmental advocates.

Enabling Action 1.2 *Design and implement a Refrigerant Management Program, including regulations and a funding structure*

A refrigerant management program is key to reducing GHG emissions from leakage and disposal of high-GWP halogenated gas refrigerant equipment usage. Other programs and states have realized significant emission reductions by adopting a refrigerant management program. Weis Markets, a key partner in the USEPA GreenChill program, has reported a 61% reduction in refrigerant leakage from 2008 to 2019 company-wide from its “multi-faceted leak prevention and reduction efforts, focused on using high-quality equipment, training, supervision, and a technician incentive plan” (USEPA, 2020).

NJDEP could implement a program similar to that of the Washington Department of Ecology, which has implemented a refrigerant management program for facilities with refrigeration and air conditioning systems. Washington focuses on those systems that contain more than 50 pounds of refrigerant with a high GWP of 150 or more. These facilities are required to “conduct and report periodic leak inspections, promptly repair leaks, and keep service records on-site” (State of Washington, Department of Ecology, 2025a). The Washington program includes features to reduce refrigerant emissions from leaky equipment and from the installation and servicing of equipment. This includes leak detection, leak monitoring, leak repair, system retrofits, system retirement planning, recordkeeping and reporting, and more.

Implementing this type of program would include promulgating regulations. The Washington State program is funded in part through registration/reporting fees from the regulated entities. That is similar to the structure that NJDEP has under its GHGMRR.

Enabling Action 1.3 *Offer complimentary technical assistance*

Building upon enabling action 1.2 above, the State will need to offer technical assistance to help the regulated community implement refrigerant management practices. NJDEP currently offers personalized assistance to facilities required to report via the GHGMRR. NJDEP would need to expand this assistance to provide education on refrigerant management practices and associated regulatory requirements and to develop guidelines and tools to help the various regulated entities comply with the program requirements. Following the example of Washington State, these regulated entities would include owners and operators of facilities with regulated refrigeration systems; distributors, wholesalers, and reclaimers; and service technicians (State of Washington, Department of Ecology, 2025a).

Table 6.3.5. Measure 1 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Convene stakeholders to inform Refrigerant Management Program	Near term	NJDEP
Design and implement Refrigeration Management Program (RMP) program, including regulations	Near term	NJDEP
Offer complimentary technical assistance	Near term – ongoing	NJDEP

Table 6.3.6. Measure 1 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
Low
Secured Funding
None
Funding gaps + opportunities
The enabling actions described in this measure would likely need additional funds to develop and implement the RMP, including staffing and running the program. New Jersey will continue to monitor federal funding opportunities to provide support to this program.
Geographic Scope
Statewide
Authority to Implement
Subject to further legal review: NJDEP has policy and planning authority, including, it appears, to implement an RMP Program. This includes P.L. 2019, c. 507; N.J.S.A. 13:1D-9, 2024); and (N.J.S.A. 26:2C-41, 1954).
Metrics for Tracking Progress
New Jersey will track the largest users of refrigerants and their compliance with the RMP to reduce their GHG emissions from leakage and disposal of high-GWP refrigerants. This will include tracking changes in leakage/disposal emissions rates from the facilities using these refrigerants and doing so via NJDEP’s existing Greenhouse Gas Monitoring and Reporting Rule. The facilities will also be required to comply with inspections and reporting provisions of the RMP program. The State will require annual reporting for the RMP as it does under the GHGMRR.

Emissions Reduction Measure 2: Implement a refrigerant replacement incentive program

Many factors can pose a challenge to the adoption of low-GWP refrigerants by facilities. These factors can include the cost of transitioning existing equipment to these refrigerants, the lack of familiarity with low-GWP refrigerants, including how they function, the types of equipment these refrigerants may require, and how to maintain that equipment. To address these challenges, the State should consider implementing an incentive program for low-GWP refrigeration systems. This program may be paired with the implementation of more energy efficient refrigeration equipment and chiller systems for even greater GHG emissions reduction benefits (Shah, Wei, Letschert, & Phadke, 2019).

New Jersey's program could include the following features:

- Provide funding to incentivize and offset the costs of retrofits and new installations of commercial refrigeration and chiller equipment using low-GWP or ultra-low GWP refrigerants in place of high-GWP refrigerants.

The new program could be structured similarly to California, Minnesota, or Delaware.

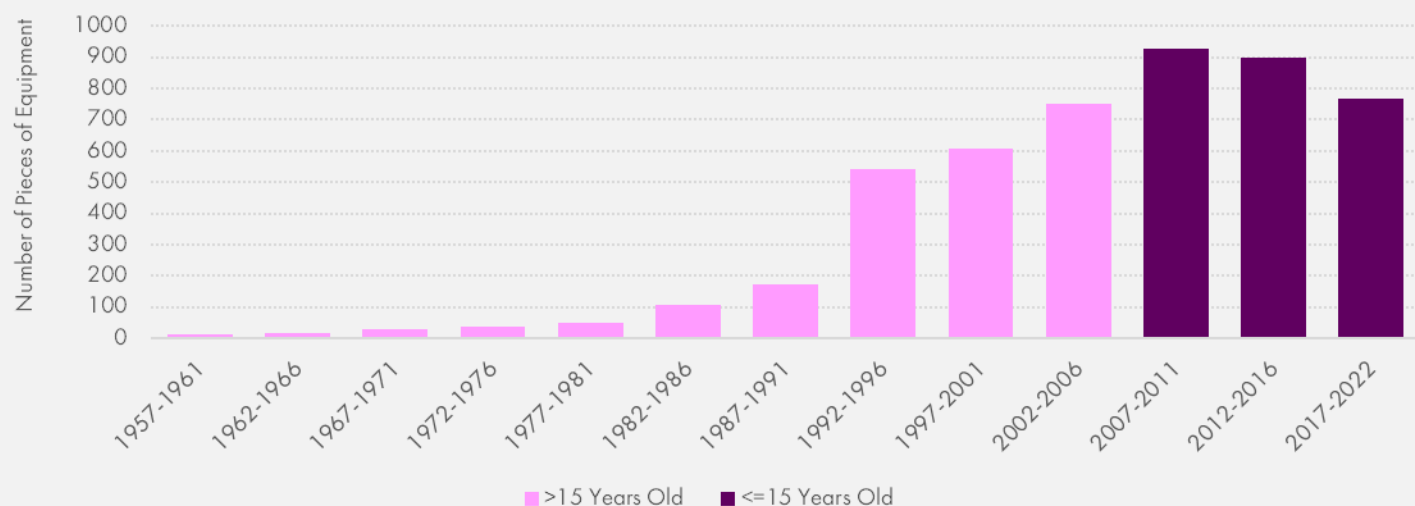
- The California Fluorinated Gas (F-gas) Reduction Incentive Program (FRIP) focuses on providing incentive funding to new and existing commercial and industrial facilities to assist them with transitioning their refrigeration systems to ultra-low GWP refrigerants having GWPs of less than 10. California prioritizes the funding of facilities located in disadvantaged and low-income communities, as defined under California state law. Funding is available across three sectors: (1) retail food refrigeration, (2) industrial process refrigeration, and (3) cold storage and other refrigeration. In 2024-2025, California's total "Round 2" program funding, including incentive awards and administration, was \$65 million. Their initial "Round 1" program was \$1 million (California Air Resources Board (CARB), 2025).
- The Minnesota Next Generation Refrigeration Grants program provides grants to retail facilities and non-profit organizations with refrigeration units that they seek to replace or retrofit to use low-GWP refrigerants between 150 and 300 GWP. In their 2025 grant application solicitation, Minnesota was offering a total of \$120,000 in funding, with a maximum grant award of \$20,000 per applicant (Minnesota Pollution Control Agency, 2025)
- The Delaware Cool Switch Low-Impact Refrigerant program provides rebates to non-residential, commercial and industrial consumers to implement retrofits and new systems with refrigerants that have a GWP of less than 1,500 and that are not on Delaware's prohibited HFC list. The program is funded using RGGI proceeds. Funding is provided at the rate of \$25 per avoided metric ton of CO₂-equivalent emissions, up to a maximum of \$250,000 (Delaware Department of Natural Resources and Environmental Control, 2024).

New Jersey has ample opportunity to slash emissions from refrigeration systems in the State. NJDEP conducted an analysis of the 2023 GHGMRR refrigeration systems' reported data. The analysis identified 4,909 refrigeration systems in the State, with ages²³ ranging from 1 year to 66 years (Figure 6.3.8). The average age was 17.3 years. Over 47% of the refrigeration systems have been in operation for over 15 years. Using a typical industry lifetime of 15 years for commercial refrigerators (Nunn, 2025), it is apparent that a significant number of refrigeration systems have surpassed their life expectancy.

²³ The installation date of each refrigeration system is being used as a proxy measurement of the age of the system.

Figure 6.3.8. Refrigeration systems by installation year from 2023 GHGMRR reports

Based on refrigeration systems' installation dates, 47% of systems were over 15 years old at the start of 2023.



The State could target incentives at the oldest refrigeration systems. Importantly, many of these systems are still using legacy ODS refrigerants such as R-22. As a result, a single replacement project can tackle both GHG emissions reductions and protection of the ozone layer. In addition, it can be more cost-effective to replace aged equipment with newer, more energy-efficient models that also use lower GWP refrigerants rather than making frequent and/or large repairs to older equipment (Papas, 2024).

Measure Quantification

With regard to the entire refrigerant usage sector, NJDEP estimates that implementation of a targeted refrigerant replacement incentive program could reduce emissions an average of 0.006 MMT CO₂e annually (Figure 6.3.9), realizing cumulative emissions reductions of 0.173 MMT CO₂e by 2050 (Figure 6.3.10.). Under implementation of this measure, sector emissions would total 4.98 MMT in 2030, 4.84 MMT in 2040 and 4.83 MMT CO₂e in 2050.

Figure 6.3.9. Annual Emissions Reductions from Measure 2, Implementing a Low-GWP Refrigerant Replacement Incentive Program (MMT CO₂e).

This targeted incentive program, applied to 20% of refrigeration systems reporting under the GHGMRR and greater than 15 years old, is expected to reduce refrigerant emissions by an average of 0.006 MMT CO₂e annually.

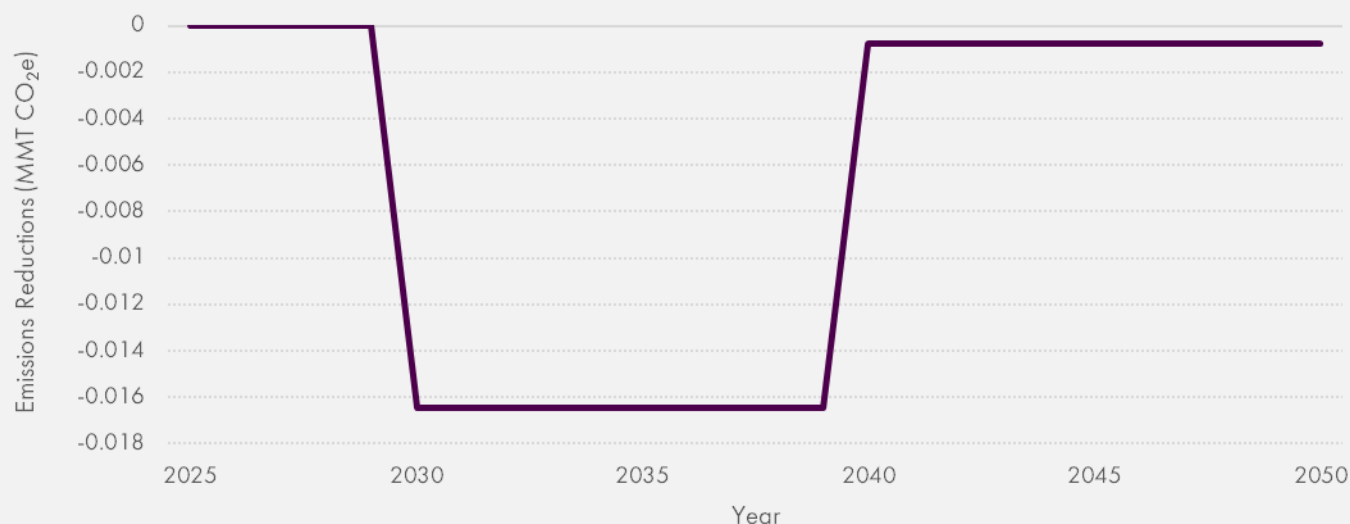
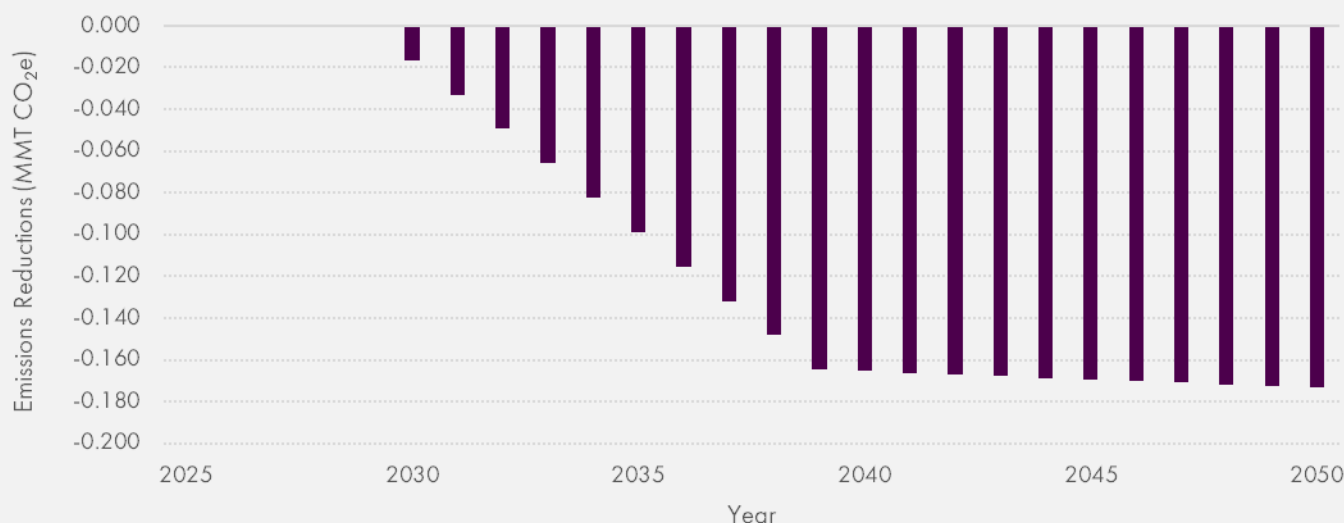


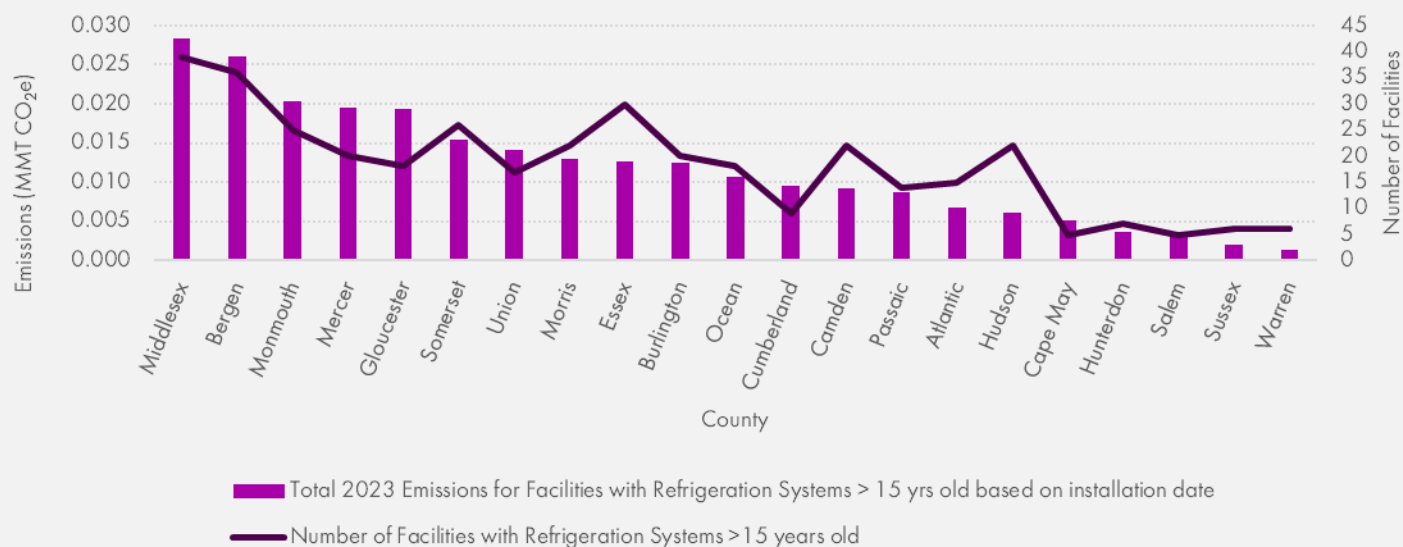
Figure 6.3.10. Cumulative Emissions Reductions from Measure 2, Implementing a Low-GWP Refrigerant Replacement Incentive Program (MMT CO₂e).
This incentive program, applied to 20% of refrigeration systems reporting under the GHGMRR and greater than 15 years old, is expected to reduce GHG emissions a total of 0.173 MMT CO₂e, 2025 - 2050.



The level of emissions from the refrigerants in the 2023 GHGMRR reports roughly correlates with county population size, with Bergen County, the most populous county in the State, having the second highest emissions. Also, the emissions roughly correlate with the number of facilities in each county, with Middlesex County and Bergen County having the largest number of facilities. Essex, Hudson, and Camden Counties have higher emissions relative to their number of facilities. (Figure 6.3.11.).

Based on the 2023 GHGMRR reports, R-134A is the refrigerant with the greatest total full charge amount across the facilities' equipment. R-134A has a GWP₁₀₀ of 1,430. On the other hand, R-404A had the largest estimated emissions across the 2023 GHGMRR reports, a total of 0.206 MMT CO₂e, based on its high GWP of 3,920 and the large number of facilities using it. Targeting refrigerants such as these in the incentive program could help to further ensure the greatest emissions reductions over time.

Figure 6.3.11. Emissions by County and Number of Facilities per County in 2023 GHGMRR Reports
Counties with more facilities tended to have higher emissions, among GHGMRR reported refrigeration systems greater than 15 years old.



Priority Enabling Actions

NJDEP has identified two critical actions to implement a low-GWP refrigerant incentive program.

Enabling Action 2.1 Convene stakeholders to inform incentive program design

Involving stakeholders early on in the process of creating an incentive program is crucial for ensuring the program is effective, fair and successful. Early buy-in from the owners and operators of refrigerant systems will ensure that funding levels are adequate and that the program spurs scalable adoption.

Enabling Action 2.1 Design and implement a low-GWP refrigerant incentive program

A State incentive program is important to achieving a more significant transition in the refrigerants used, in accordance with the substantial phasedown of refrigerant-related emissions under the AIM Act and Kigali Amendment to the Montreal Protocol (United Nations Environment Program, 2016). This can be achieved by implementing a program that offers subsidies in the form of grants and/or rebates that encourage facilities to retrofit or replace equipment that uses high-GWP refrigerants with equipment using low-GWP refrigerants. New Jersey could follow the example of a state such as California, Delaware, or Minnesota, as described above. Furthermore, the New Jersey program would build on the NJEDA NJ Cool Program, with its initial funding of \$15 million across multiple areas of energy efficiency. A starting program focused solely on a low-GWP refrigerant incentive program could be a percentage of that funding, such as the \$1 million round 1 program in California.

Other considerations for the design of the program include the following:

- Consider a possible set-aside of a certain percentage of the funding and/or a higher grant award amount for projects in overburdened communities.
 - The NJ Cool Program is already focused on providing grants to building owners and tenants in State-designated “overburdened communities” and “adjacent communities.”
 - An NJDEP analysis found that the 5 municipalities with food deserts with the highest emissions in their 2023 GHGMRR reports were Jersey City, Long Branch, Cinnaminson, Vineland, and Clementon. (Nguyen, 2025) Of these municipalities, Jersey City had the highest refrigerant emissions in the “retail trade” sector. Food deserts have substantial overlap with overburdened communities.
- A focus on the “retail trade” sector would also be appropriate given its outsized usage of refrigerants, including those with high GWPs, especially in supermarkets (Figure 6.3.5.).
- Due to their high use of refrigerants, including ones with high GWPs, the New Jersey counties of Bergen and Middlesex may be a good place to start to focus this program (Figure 6.3.11.).

Table 6.3.7. Measure 2 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
Convene stakeholders to inform incentive program design	Near term	NJDEP
Design and implement a low-GWP refrigerant incentive program	Near term and ongoing	NJDEP

Table 6.3.8. Measure 2 Implementation Approach.

Plan to Leverage Funds
Cost of Measure
Low
Secured Funding
None

Funding gaps + opportunities

New Jersey will continue to monitor federal funding opportunities to provide support to this program.

Geographic Scope

Statewide

Authority to Implement

Subject to further legal review:

- NJDEP has policy and planning authority, including, it appears, to implement a low-GWP refrigerant replacement incentive program. This includes P.L. 2019, c. 507, N.J.S.A. 13:1D-9, and N.J.S.A. 26:2C-41.

Metrics for Tracking Progress

Under this program, New Jersey will track the amount of funding being offered as grants, the funding being used to run the program, the amount of high-GWP refrigerants used by the largest users reporting under the GHGMRR, the facilities with the largest GHG emissions from high-GWP refrigerant usage, and the change in emissions before and after implementation of each grant made.

STAKEHOLDER FEEDBACK

NJDEP and other State agencies regularly engage with stakeholders on issues surrounding GHG emissions from all different sectors of the economy, including halogenated gases. During the development of a Capstone project regarding an NJDEP refrigerant management program, NJDEP staff conducted a survey of refrigerant system technicians regarding refrigeration management practices. The survey found several challenges in refrigerant management including the following:

“...a shortage of skilled personnel, difficulties in maintaining leak detection equipment, and inaccurate tracking and quantification of refrigerant leaks.” - (Bakos, 2024, p. 31)

An NJDEP RMP would include offering complimentary technical assistance. See “Emissions Reduction Measure 1: Implement a refrigerant management program,” above.

Also, during the stakeholder outreach efforts of NJDEP for the Priority Climate Action Plan, released in March of 2023, the Department held a webinar specifically on halogenated gases. While comments then and at other times have generally focused little on refrigerants and their impact on communities, the issue of worker health is important and NJDEP has mentioned it to stakeholders. A State program such as the RMP described in Measure 1, above, would reduce emissions of refrigerants from their regular leakage and during disposal, and they are thereby expected to contribute to the increased health protection of workers who handle the refrigerants. The impact of these measures on workers and workforce development is further described in Appendix E.



BLACK CARBON

CHAPTER 6.4

.0

OVERVIEW

Black carbon, or “soot,” is an aerosol component of particulate matter (PM) and is formed in varying concentrations with other particulate matter through the incomplete combustion of fossil fuels and biomass burning (Minjares, Wagner, & Akbar, 2014). It contributes to climate warming differently than climate gases since it is made up of larger particulates. For example, unlike well-mixed gases such as carbon dioxide (CO₂) that can remain in the atmosphere for hundreds of years, black carbon is quickly removed by rain and deposition in a few days or weeks (CARB, 2018). Its global warming potential²⁴ (GWP) is widely debated and varies greatly depending mostly on the time horizons considered. This report applies a black carbon GWP₁₀₀ of 910 (CARB, 2018) and a GWP₂₀ of 3,200 (Bond, 2013).

Sources of black carbon also emit other types of aerosols such as organic carbon (OC). As stated in California’s Short-Lived Climate Pollutant Strategy, “[s]cientists have known for some time that sources that emit black carbon also emit other short-lived particles that may either cool or warm the atmosphere. Lighter colored particles, for example, tend to reflect rather than absorb solar radiation and so have a cooling rather than warming impact” (CARB, 2017).

Although the climate impact of black carbon in the State is relatively small in comparison with other climate pollutants, it compromises local air quality disproportionately. For example, black carbon from diesel combustion is a known carcinogen. Reducing black carbon therefore has benefits beyond those associated with climate protection. Fortunately, because black carbon largely arises from combustion of fossil fuels, the transition to clean energy in other sectors will also bring reductions in black carbon emissions.

²⁴ The Global Warming Potential (GWP) was developed to allow comparisons of the global warming impacts of different gases. It is a measure of how much energy the emissions of 1 ton of a gas will absorb over a given period of time, relative to the emissions of 1 ton of carbon dioxide (CO₂).

WHERE WE STAND

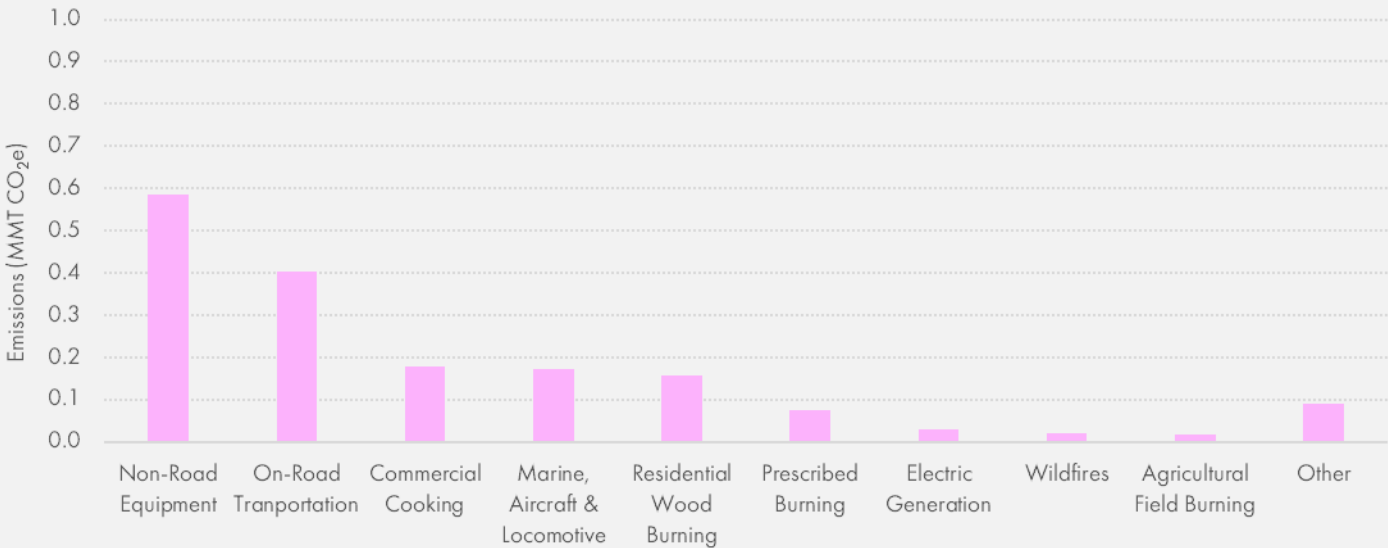
Black carbon emissions in the State have consistently trended downward from 2005 through 2020 [the most recent year for which full data is available]. Emissions dropped from 5.8 million metric tons (MMT) carbon dioxide equivalent (CO₂e) in 2005 to 1.7 MMT CO₂e in 2020, based on a 100-year global warming potential (GWP₁₀₀)²⁵. (Table 6.4.1).²⁶ These reductions were due in large part to New Jersey’s stringent standards for fine particulate matter emissions from stationary sources as well as state and federal regulations targeting on-road vehicles.

Table 6.4.1. Black Carbon Emissions in New Jersey, 2005-2020 (MMT CO₂e).
Reduced particulate emissions from stationary sources and motor vehicles have led to consistent reductions over time.

	2005	2006	2008	2011	2014	2017	2020
GWP ₁₀₀	5.8	5.6	4.2	3.6	3.0	2.3	1.7
GWP ₂₀	20.2	19.8	14.9	12.7	10.5	8.1	6.1

Emissions from non-road equipment such as backhoes, bulldozers, and cranes were responsible for 34% of black carbon emissions during 2020 which constitutes the largest share among major categories (0.6 MMT CO₂e based on GWP₁₀₀)²⁷. On-road transportation generated 0.4 MMT CO₂e based on GWP₁₀₀²⁸, representing 23% of black carbon emissions. Commercial cooking contributed 10.3%, and marine, aircraft and locomotive transportation added 9.9%, making them the third and fourth largest categories respectively. Woodburning, prescribed burns, wildfires and agricultural field burning also released notable amounts of black carbon (Figure 6.4.1).

Figure 6.4.1. Black Carbon by Source (GWP₁₀₀, Total 1.7 MMT CO₂e), 2020, New Jersey.
Non-road equipment and on-road transportation were the two greatest sources of black carbon.

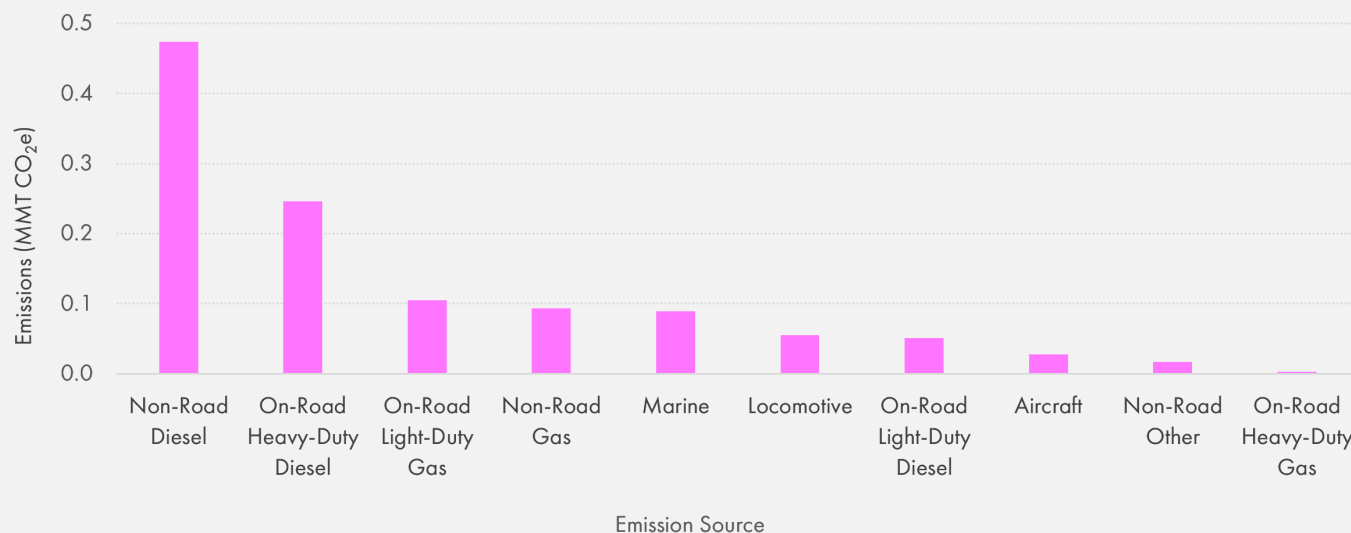


²⁵ Using a 20-year global warming potential (GWP₂₀), the black carbon emissions dropped from 20.2 MMT CO₂e in 2005 to 6.1 MMT CO₂e in 2020
²⁶ Black carbon emissions estimates were developed using data from the USEPA National Emissions Inventory (NEI), with additional on-road data from the USEPA EQUATES program and NJDEP. On-road estimates were developed using the USEPA MOVES transportation model. Additional details on methodology can be found in NJDEP (2024).
²⁷ 2.1 MMT CO₂e based on GWP₂₀
²⁸ 1.7 MMT CO₂e based on GWP₂₀

Separating out the mobile sources, which include non-road equipment such as cranes, on-road transportation such as cars and trucks, and non-road transportation such as airplanes and ships, black carbon emissions in 2020 totaled 1.2 MMT CO₂e based on GWP₁₀₀. Non-road diesel equipment emitted 0.5 MMT CO₂e based on GWP₁₀₀ or 41% of the mobile sources group total (Figure 6.4.2). On-road heavy-duty diesel was responsible for 21% of the grouping total, followed by on-road light-duty vehicles (9.1%). Gasoline-powered non-road equipment and marine transportation followed at 8.0% and 7.7%, respectively.

Figure 6.4.2. Black Carbon Emissions from Mobile Sources in 2020 based on GWP₁₀₀

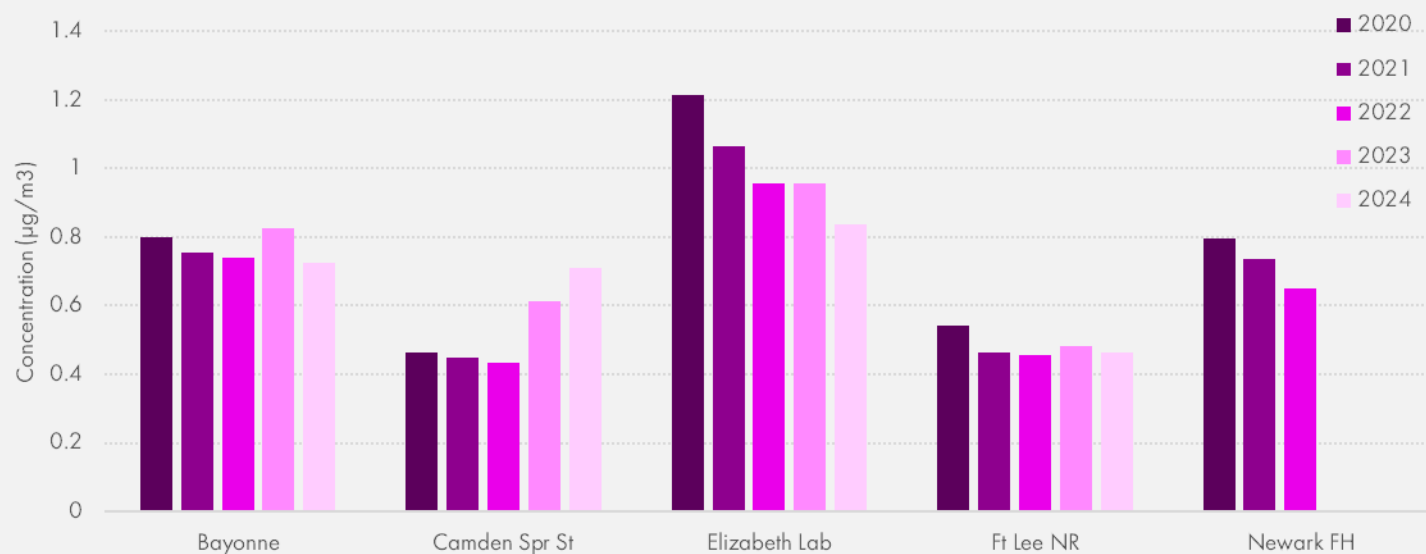
Total 1.2 MMT CO₂e. Diesel-powered non-road equipment was the largest contributor in the mobile source category.



New Jersey also has several sites that directly measure black carbon via aethalometers or through speciation of particulate matter of 2.5 microns or smaller (PM_{2.5}) (NJDEP, 2024b). Specifically, five sites in NJDEP's air monitoring network collect samples of PM_{2.5} that are then analyzed to determine the chemical makeup of the particles (Figure 6.4.3). This data collection is a part of USEPA's Chemical Speciation Network. The results of the data are generally consistent with the CARB study, illustrating a downward trend of PM_{2.5} and black carbon, and these findings can be used to focus future diesel black carbon emission reduction strategies in densely populated areas subject to high concentrations of black carbon.

Figure 6.4.3. Black Carbon Annual Average Concentrations by Site 2020-2025.

New Jersey also has several sites that directly measure black carbon via aethalometers or through speciation of PM_{2.5}.



Business-as-Usual & Current Policy Scenarios

The New Jersey 2024 EMP's Integrated Energy Plan emissions modeling did not include assumptions or projections specific to black carbon. However, the Global Warming Response Action 80x50 Report, released in 2020 (NJDEP, 2020), provides applicable analysis. The report finds that continuation of existing federal diesel standards, even without future policy development, will continue to drive down black carbon emissions in the State.

Critical Emission Reduction Policies Adopted Since 2020²⁹

Since the release of New Jersey's 80x50 Report, the State has continued to adopt policies and programs that will reduce black carbon emissions.

Transportation Electrification Rules

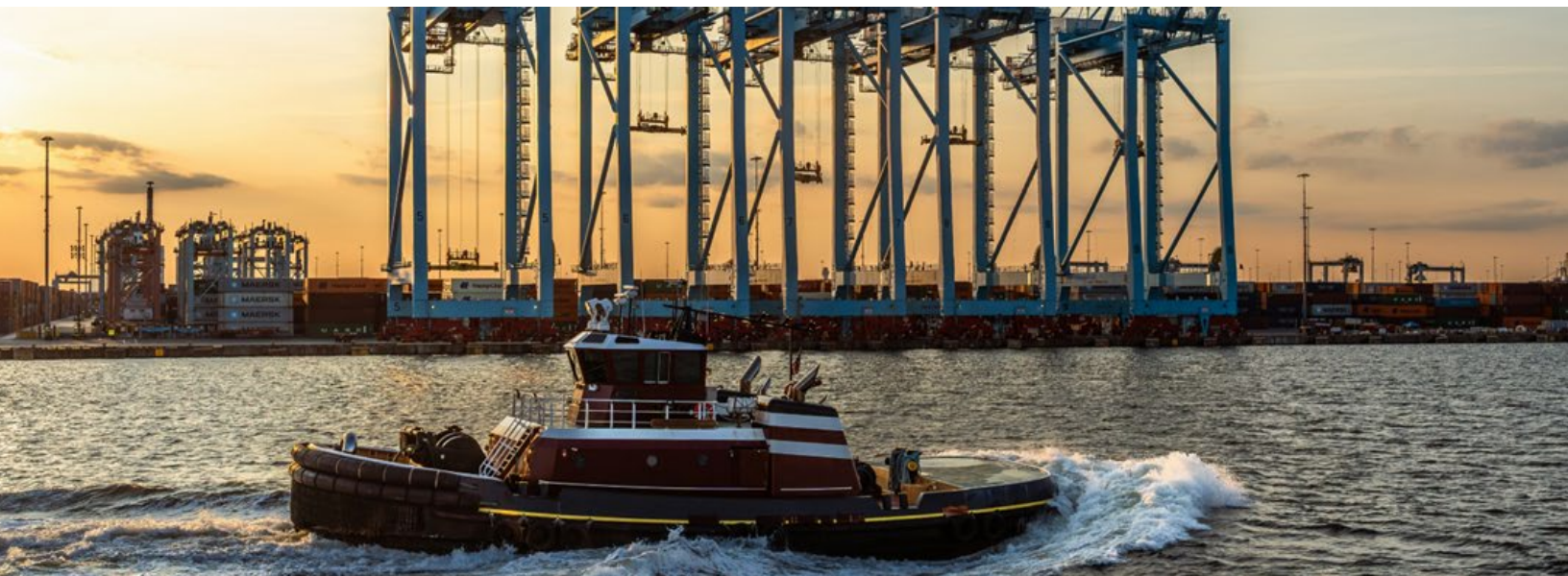
As discussed in the Transportation Chapter of this report, New Jersey has adopted a series of rules to encourage the transition from fossil fuel-powered cars and trucks to electric alternatives. Specifically, the Advanced Clean Cars, Advanced Clean Cars II and Advanced Clean Truck Rules will directly eliminate black carbon.

NJDEP's Diesel Modernization Program

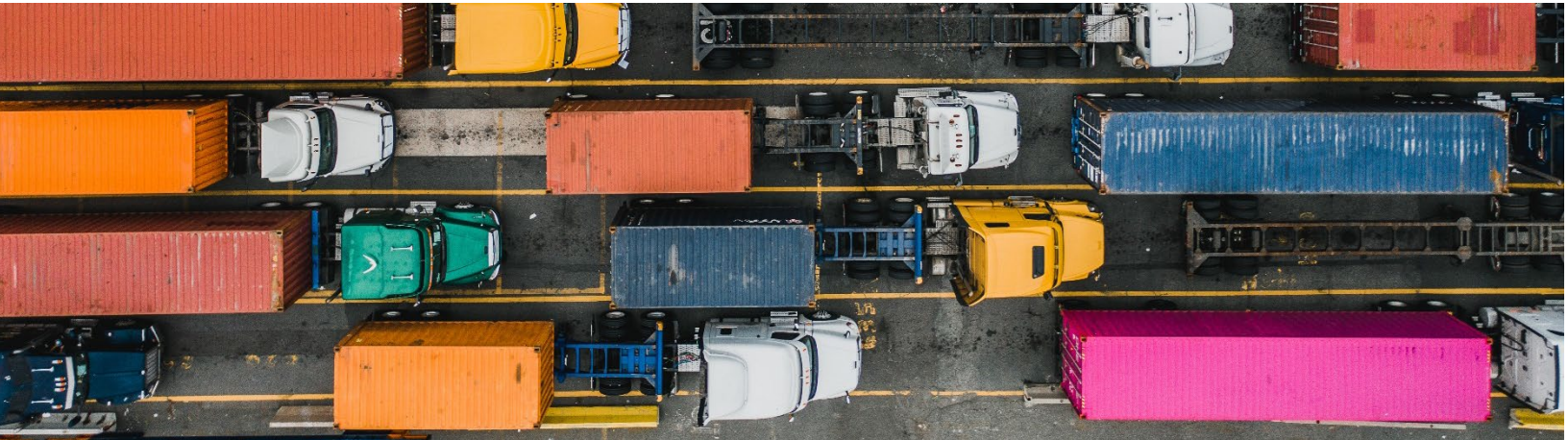
NJDEP's Diesel Modernization Program supports the replacement of both on-road and off-road vehicles and equipment with cleaner alternatives. The program supports a broad range of vehicle types such as construction equipment, port and airport equipment, refuse trucks, and ferry vessels. Eligible project types include electrification, cleaner diesel engines, and marine vessel repowers.

USEPA Clean Ports Program

In October 2024, the Port Authority of New York and New Jersey (PANYNJ) was awarded \$451 million through the USEPA's Clean Ports Program. These funds will help deploy electric drayage trucks and accompanying charging infrastructure, as well as electric cargo handling equipment.



²⁹ Refer to the 80x50 GWRA report for a summary of relevant policies prior to 2020 (NJDEP, 2020).



THE PATH FORWARD

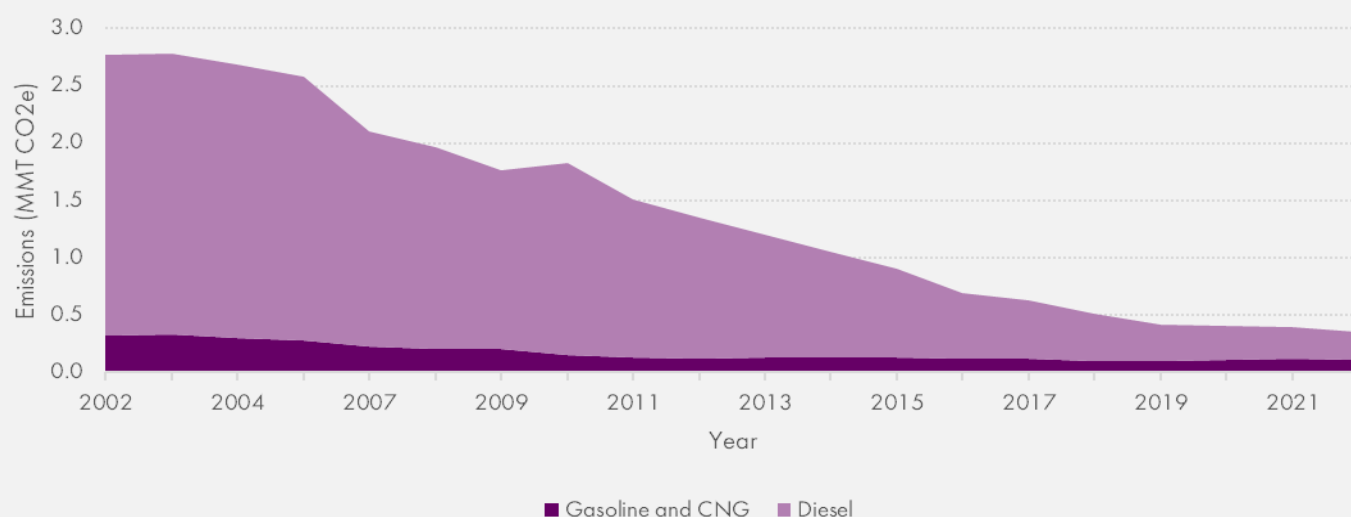
New Jersey's black carbon emissions, while lower than other pollutants, have a significant impact on public health (Brown, 2013). Thus, reducing black carbon is an important consideration in the State's journey to mitigate greenhouse gas emissions. Due to their interconnected relationship, in this report, black carbon reductions are addressed via implementation of measures found in other chapters of the report. Measures from the Transportation, Commercial, Industry, and Waste & Agriculture, and Natural and Working Lands sector chapters, described in greater detail below, will help to reduce black carbon. Additionally, possible cross-sector strategies for reducing black carbon emissions are also discussed in the Wholistic, Cross-sector GHG Reduction Approaches section, Chapter 8 of this plan.

Emissions Reduction Transportation Chapter Measure 1: Continue to implement all current policies and expand current transportation electrification programs

In order to achieve its goals, New Jersey must continue to implement ACC, ACCII, and ACT and incentivize rapid, widespread adoption of electric vehicles throughout the State. Policies aimed at increasing the sales share of medium- and heavy-duty electric vehicles, including zero-emission buses, and off-road zero-emission vehicles, as well as increasing the availability of public and non-public charging infrastructure for these applications are key to achieving the goals of this measure. Black carbon from on-road vehicles is largely attributed to medium- and heavy-duty trucks, accounting for approximately 69% of on-road vehicle emissions of black carbon in 2022 (Figure 6.4.4). Off-road diesel engines in the transportation sector, such as vehicles operating as airport ground support and port cargo handling equipment, account for the largest share of black carbon from mobile sources. Specifically, transportation enabling action 1.8 calls for the implementation of further policies to increase the share of off-road zero emission vehicle (ZEV) sales. This will help drive black carbon emission reductions in the mobile source category. Current policies evaluated under Transportation Measure 1 will have a dramatic impact on reducing black carbon through 2050.

Figure 6.4.4. Black Carbon from On-Road Vehicles.

Black carbon emissions from diesel vehicles are much greater than for gasoline and compressed natural gas (CNG) vehicles. But more stringent emissions standards for diesel engines have led to remarkable improvements over the past two decades.



installation cost than gas cooking equipment (USEIA, 2023), Enabling Action 4.9 of this measure calls for expanding incentives for all-electric appliances and equipment that could make this transition more appealing to consumers. As additional incentives and market sales share of electric commercial appliances in the market increase, the costs of installing and operating electric commercial cooking appliances will be reduced even further. This is especially compared to the expected increase in the cost of natural gas as overall demand for it falls due to the economywide shift towards electrification. These dynamics are likely to spur additional retrofit and replacement of existing commercial cooking equipment, further reducing black carbon from this source.

Emissions Reduction Industry Chapter Measure 1: Adopt manufacturing equipment efficiency standards and incentives for energy efficient technologies.

As part of the enabling actions under this measure from the industrial sector, the State will take steps that further incentivize electrification and reductions of energy use at industrial facilities and in organizational operations. This may include the electrification, retrofit or reduction in the use of some non-road diesel equipment and captive non-road sources. An example of these sources is construction equipment which includes backhoes, bulldozers, cranes, and other on-site vehicles that support extended operations and are responsible for a large share of the State's black carbon emissions.

Emissions Reduction Industry Chapter Measure 2: Implement a mandatory emissions reduction program for high-emitting sources in the industrial sector.

The creation of a reduce-and-invest program that would set a declining cap on emissions from high-GHG emitting industrial sources in the State could contribute to reductions in black carbon emissions. These emissions reductions could come from non-road diesel equipment engines and captive non-road sources. Emission reductions achieved through operational changes and the replacement of fuel-burning equipment with zero-emission or cleaner alternatives may be some of the most cost-efficient reductions available to regulated entities. An estimate of the impact of this policy on black carbon emissions is not available. It would depend heavily on the policy's design and on which industries would be subject to the program.

Emissions Reduction Waste & Agriculture Chapter Measure 1: Adopt stricter rules and incentives for monitoring emissions, landfill caps, and odor controls at landfills and wastewater treatment facilities

Enabling Action 1.3 in the Waste and Agriculture measure is to "Encourage wastewater facilities to increase on-site dewatering." A key component of this measure is to provide incentives for facilities to enhance the dewatering of residual biosolids and reduce the volume of sludge and other wastewater outputs requiring disposal. This material is moved around the State (or out of state) by barge, rail, or truck. The fewer trips made by trucks, train cars, and barges, the less the black carbon and other particulate matter emissions that are generated from burning fuel from these forms of transportation. Of these forms of transportation, especially rail and trucks produce black carbon emissions. By capturing biogas at waste water treatment facilities (WWTF), and harnessing that energy, WWTFs can perform dewatering on-site, thus reducing the amount of transportation necessary to process sewage outflows. Biogas energy can be applied in combined heat and power systems, and other infrastructure to allow more facilities to do more processing before outputs leave sewerage plants. Interested WWTFs have indicated that incentives and financing support are a major barrier to implementation.

Emissions Reduction Natural Working Lands – Carbon Sequestration Chapter

Measure 2: Protect, maintain, and avoid the conversion of natural lands, including 21,000 acres of forested lands, through high-carbon land acquisitions and policies that promote location-efficient development.

Enabling action 2.4 which calls for the State to “implement proactive forest management and other carbon defense practices” will help mitigate catastrophic wildfire events that release not only stored carbon into the air, but also release black carbon. “Low and from below thinning” is one key carbon defense practice that could reduce black carbon from wildfires. While prescribed burning, one of the other critical carbon defense practices identified is also a *source* of black carbon, managing the increasing threat of catastrophic wildfires is vital. The careful selection of forests for prescribed burning in places where the risk of forest loss due to tree deaths from wildfire is high can provide net reductions in black carbon emissions compared to an alternative where these defense actions are not taken.

STAKEHOLDER FEEDBACK

While stakeholders who participated in the in-person and virtual community dialogues did not comment on reducing black carbon emissions explicitly, several concerns of stakeholders are connected to diesel combustion engine activities that produce black carbon and its associated negative health effects. Concerns primarily focused on diesel trucks, ports, the development of new warehouses and the current operations of existing warehouses in their communities and the associated diesel equipment emissions.

Warehouses and Diesel Trucking

Attendees across all sessions cited concerns about new warehouse developments locally which came with large dump trucks and associated emissions and traffic congestion. Some participants were concerned about specific potential emissions violations from trucks and other sources in their community, and they weren't sure who to contact about that.³¹ Participants cited personal experiences and witnessing diesel truck congestion and stationing for long periods of time at sites.



"When I worked for a warehousing company many years ago, we were around diesel trucks multiple hours a day. When I used to come home a lot of time people (in Gloucester county) would develop breathing issues from exposure to that. If you live by these facilities a lot of the air pollution is blown into people's houses, windows and yard."

-Participant in the Central and South Jersey Climate Action Community Dialogue in June 2025



*"Many companies want to take the land, come through with diesel trucks that pollute the town and the water... These are contributing to health concerns in the community. **There are high rates of Parkinson's and other autoimmune diseases and cancer in local communities in Salem County because of the harmful effects from pollution.**"*

-Participant in the Central and South Jersey Climate Action Community Dialogue in June 2025



New warehousing and data center developments were identified by participants to have broad implications for communities including increased diesel trucks that produce traffic congestion and air pollution and increased localized energy use/demand which means more emissions. New warehousing was also noted to limit available space and locations for new affordable housing in the community, which concerned participants. Participants felt there should be laws requiring that new buildings like warehouses have solar on their rooftops or over parking lots and that the buildings include installations of electric vehicle charging stations. One participant felt that there is an opportunity for smaller, distributed clean energy resources where people could share power with neighbors, or facilities could provide clean, renewable power to the surrounding community. While not stated explicitly in the stakeholder comments, the electrification of diesel trucks and installation of electric vehicle charging stations would help directly reduce black carbon from on-road

transportation sources. Installation of distributed energy resources among neighborhoods is also likely to help reduce the use of on-site diesel generators, another source of black carbon, while also providing enhanced energy resiliency.

Diesel Buses

Participants in the Newark dialogue expressed that it is "a huge issue," that diesel buses continue to be purchased for public transportation and to transport children to and from school. This concern was echoed at the virtual dialogues held in June 2025, where participants felt that, despite the recent gains in electrifying school buses, the transition is still occurring much too slowly in most New Jersey communities. While replacement of diesel trucks and buses with cleaner Tier 4 diesel engines significantly reduces black carbon, and co-pollutants such as NO_x and PM, direct emissions of these pollutants are not eliminated. In addition, the replacement of these vehicles has a minimal effect on reducing GHG emissions, instead guaranteeing that these emissions continue for the lifetime of the new vehicle.

Ports

Participants at the community dialogue held in Newark in December 2023, emphasized the need to electrify ports and establish zero emissions zones at ports. These efforts would also involve the creation of an advisory committee for long shoreman to work with PANYNJ with stipends.

³¹ The WARN DEP enforcement hotline 1-877- WARN DEP (1-877-927-6337) should be used to report incidents including emissions, chemical releases, wildlife issues or other type of environmental concern.

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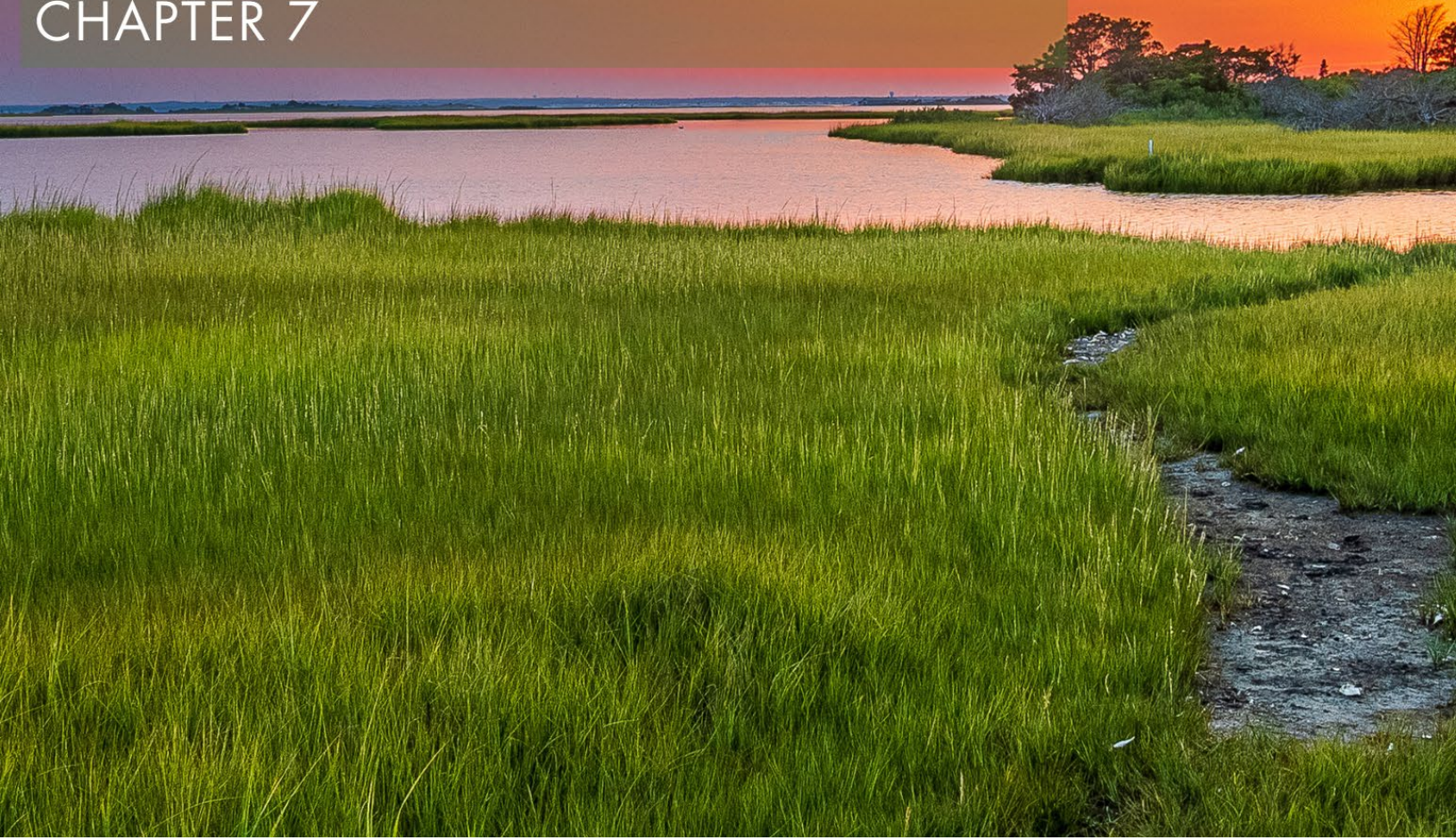
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NATURAL & WORKING LANDS — CARBON SEQUESTRATION

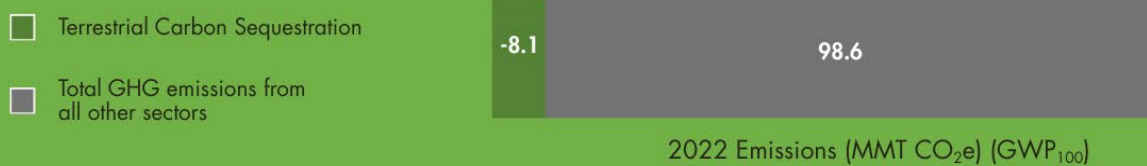
CHAPTER 7



CARBON SEQUESTRATION SECTOR SNAPSHOT

2022 NJ EMISSIONS ACTIVITIES AND DATA

Conversion of natural and working lands for development and wasteful land management practices can destroy or disrupt natural carbon sinks and reduce the ability of natural lands to store carbon dioxide (CO₂) and methane. In addition, as the climate changes, flood inundation, wildfires, and increased pests and diseases present an increased threat of loss to forests, marshes and agricultural lands. Natural and working lands sequestered 8.1 MMT CO₂e of New Jersey's greenhouse gas emissions in 2022.



SEQUESTRATION GOAL

9.2 MMT CO₂e

2050 EMISSIONS PROJECTIONS



GHG REDUCTION MEASURES AND ENABLING ACTIONS

Measure 1: Strengthen and expand existing natural carbon sinks through reforestation, afforestation, and restoration

- 1.1 Afforestation of at least 4,000 acres
- 1.2 Reforest at least 2,000 acres of degraded forests
- 1.3 Plant 1,000,000 street or shade trees
- 1.4 Redevelop at least 1,000 acres (200 sites) of brownfield sites into new green space
- 1.5 Plant cover crops with harvested and cropland pasture lands on 40,300 acres
- 1.6 Increase cover of salt marsh vegetation by at least 3,000 acres
- 1.7 Install at least 202,000 feet of living shorelines
- 1.8 Restore 20,000 acres of Atlantic White Cedar Swamps
- 1.9 Complete 45 tidal reconnection projects to increase salinity from fresh to salt
- 1.10 Restore and replant 25 acres/yr of SAV in 2050

Measure 2: Protect, maintain, and avoid the conversion of natural lands, including 21,000 acres of forested lands, through high-carbon land acquisitions and policies that promote location-efficient development

- 2.1 Continue and expand State-led, high-carbon land acquisitions
- 2.2 Facilitate and incentivize long-term conservation and stewardship of private lands
- 2.3 Explore additional, statewide smart growth land use reforms that limit the development of natural lands and concentrate development in already developed or built-up areas.
- 2.4 Implement proactive forest management and other carbon defense practices
- 2.5 Protect existing submerged aquatic vegetation (SAV) from further loss (with no-net loss in SAV)

OVERVIEW

New Jersey's forests, wetlands and preserved open spaces are important in satisfying the Global Warming Response Act 80x50 goal. These lands act as natural sinks¹ that work to remove greenhouse gases (GHGs) from the atmosphere (IPCC, 2014). If New Jersey implements the measures proposed in this plan, GHG emissions will be reduced to 33.7 million metric tons (MMT) carbon dioxide equivalent (CO₂e) by 2050, still falling short of the 80x50 goal of 24.1 MMT CO₂e. Natural sinks will be needed to offset gross emissions.

Fortunately, New Jersey's natural lands currently sequester over 8 MMT CO₂e, therefore protecting and maintaining these carbon sinks are vital to the State's long term GHG reduction strategy. New Jersey has large areas of permanently preserved lands that could be restored and managed to better protect existing carbon stocks² from wildfire, insects, disease, inundation, and erosion (NJCAA, 2014; Lathrop & Bognar, 2014; Crocker, et al., 2013). Initial efforts have focused on developing a statewide carbon sequestration plan that establishes a target for both blue carbon³ and terrestrial carbon sequestration⁴: *Strategy to Advance Carbon Sequestration on New Jersey's Natural and Working Lands* which was published in September 2024 (NJDEP). The State has begun and will continue to fund projects that specifically aim to protect and sequester carbon through forests and tidal wetlands and is in the process of evaluating the relative carbon sequestration impacts of various blue carbon strategies and techniques.

¹ The Intergovernmental Panel on Climate Change (IPCC) defines a sink as any process, activity or mechanism that removes a GHG, an aerosol or a precursor of a GHG or aerosol from the atmosphere (IPCC, 2014).

² Carbon stock is the amount of carbon that has been sequestered from the atmosphere and is now stored within the ecosystem, mainly within living biomass and soil.

³ Blue Carbon refers to organic carbon that is captured and stored by the oceans and coastal ecosystems, particularly by vegetated coastal ecosystems: seagrass meadows, tidal marshes, and mangrove forests (Macreadie, 2017).

⁴ Terrestrial carbon sequestration is a process that involves the capture of carbon dioxide from the air by plants through photosynthesis, and storage of that carbon in woody biomass and in plant-derived soil organic carbon (USDOE, 2010).

WHERE WE STAND

It is estimated in the New Jersey Greenhouse Gas Inventory that the State’s land sector (forests, woodlands, agricultural lands and wetlands) sequestered the equivalent of 8.1 MMT CO₂e in 2022. This estimate is based on the quantity of carbon stored in both biomass and soil for forests, grasslands, agricultural lands, and wetlands. However, due to difficulties in accounting for wetlands, estimates of carbon sequestration may be undercounting the role of wetlands in sequestration. Sequestration of atmospheric carbon offset some of the State’s GHG emissions described in the previous chapters.

The New Jersey Department of Environmental Protection (NJDEP) supported a study by Rutgers University (Lathrop R. , 2011) to more accurately quantify the capacity of New Jersey forests to sequester carbon. Updated biomass carbon density factors derived from that study have been used to estimate forest sequestration in the New Jersey GHG Inventory. New Jersey is currently developing a new methodology for sequestration analysis and will publish updated sequestration estimates in a future release of the State GHG Inventory report. The new analysis will continue to use New Jersey’s land use and land cover data, but will apply improved measurements of land use change over time. New Jersey will continue to generate data on the sequestration capabilities of New Jersey’s State lands through improved monitoring and measurement.

Between 2006 and 2022, New Jersey realized an increase of 2.1 MMT CO₂e in carbon sequestration (Table 7.1). Terrestrial carbon sequestration in New Jersey is assumed to have remained constant between 2013 and 2022.

Table 7.1. Annual GHG Sequestration in New Jersey 2006 – 2022 (MMT CO₂e, GWP₁₀₀ and GWP₂₀).

	2005	2006	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
GWP ₁₀₀	-6.0	-6.0	-8.1	-8.1	-8.1	-8.1	-8.1	-8.1	-8.1	-8.1	-8.1	-8.1

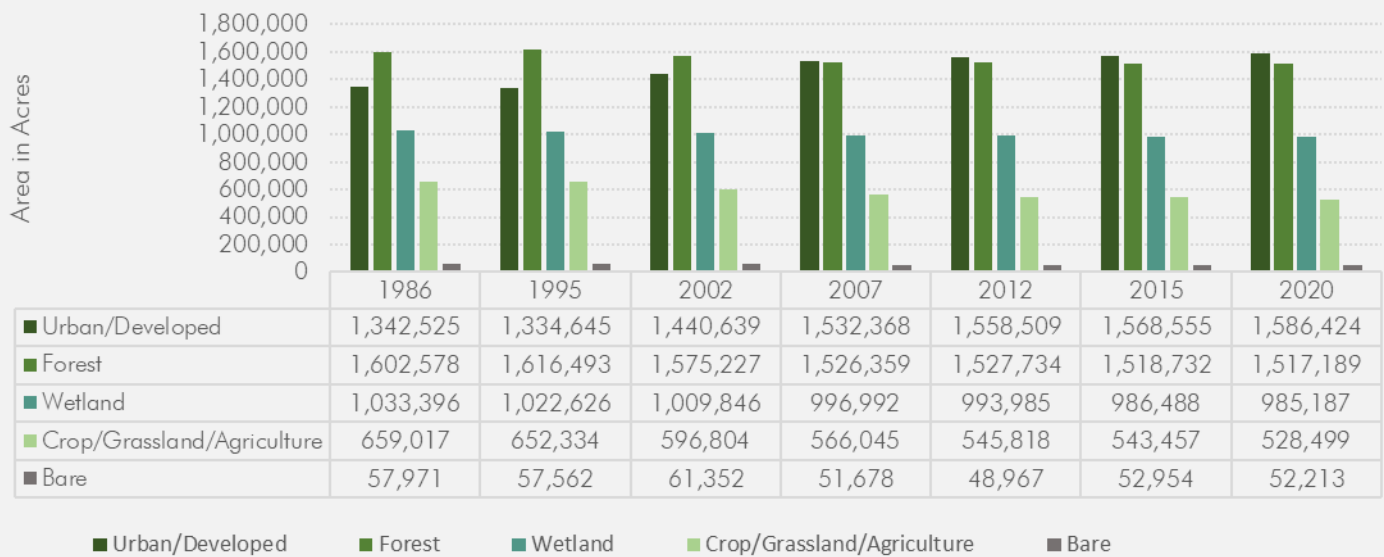
The slight gains in sequestration totals are attributed to carbon accumulation in biomass and soil due to continued maturation of New Jersey forests and wetlands. While this growth is noteworthy, the State’s land use decisions continue to reduce the acreage of its valuable carbon sinks. The ability of land to sequester carbon is significantly impacted by changes in land use (USDOE, 2010). Between 1986 and 2020, New Jersey saw an increase of more than 240,000 acres in land categorized as urban or developed, and experienced decreases in acreage of upland forests, cropland, and grassland (Figure 7.1).⁵ Land acreage classified as wetlands has decreased by more than 48,000 acres since 1986 (Figure 7.1).

In 2022, the State’s Natural and Working Lands sequestered a total of 8.1 million metric tons of CO₂e.

⁵ Based on land use change calculations completed by the DEP Bureau of Climate Change and Clean Energy, August 2025.

Figure 7.1. New Jersey Land-Use Trends, 1986 – 2020.

Development pressures have led to losses of forest, wetlands and agricultural lands.



While the rate of growth in urban/developed land has slowed in more recent years, due in part to the Great Recession of 2008, changes in housing market preference, and New Jersey’s strong land preservation policies (Lathrop & Bogнар, 2016), the overall percentage of urban/developed land in New Jersey continues to grow each year. Studies suggest that New Jersey is likely to be the first state in the nation to reach build-out (Hasse, 2009). New Jersey municipalities have constitutional obligations to develop and provide opportunity for affordable housing.⁶ Pressures to meet these municipal mandates as well as increasing solar development pressure are both factors influencing the conversion of natural and working lands to urban/developed uses. Between 2012 and 2015 New Jersey developed almost 10,000 acres of forest, about 7,000 acres of wetland and over 2,000 acres of crop/grassland.⁷ Between 2015 and 2020 the pace of forest and wetland losses slowed, but New Jersey lost almost 15,000 acres of agricultural land over this period and developed over 17,000 acres of land. A total of 34% of New Jersey’s land area was classified as urban/developed in 2020 (Table 7.2).

⁶ The Department of Community Affairs published the most recent non-binding calculations of municipalities’ present and prospective need for affordable housing (for 2025 to 2035) in October of 2024, using a formula outline in P.L. 2024, Chapter 2.

⁷ Based on land use change calculations completed by the DEP Bureau of GIS, January 2020, update in August 2025.

Table 7.2. Distribution and Trends in New Jersey's Developed and Natural Lands from 2015-2020.

New Jersey experienced losses to upland forests, wetlands, and crop/grasslands over this period, while also experiencing increases in lands classified as urban or developed.

New Jersey Total Land Use (Acres and Percent of Total)		
<i>Land Use/Natural Resource</i>	<i>Area (acres)</i>	<i>Percent (%) of Total Land Area</i>
Urban/Developed	1,586,424	34%
Upland Forest	1,517,189	32%
Wetland	985,187	21%
Crop/Grass Land	528,499	11%
Bare	52,213	1%

Land Use Change from 2015 to 2020		
<i>Land Use/Natural Resource</i>	<i>Area Change (acres)</i>	<i>Type of Change</i>
Urban/Developed	17,869	increase
Upland Forest	-1,543	decrease
Wetland	-1,301	decrease
Crop/Grass Land	-14,958	decrease
Bare	-741	decrease

In addition to development trends, the State's carbon stocks are also affected by land management techniques, particularly in agricultural lands, coastal wetlands, and forests. In agricultural lands the frequency of tillage and vegetation changes can have long term soil carbon impacts (Reicosky, 2003). Agricultural practices that disturb the soil such as tilling, planting mono-crops, removing crop residue, excessive use of fertilizers and pesticides and over-grazing remove carbon from the soil (Lal R, 2011). In coastal wetlands, practices that cut off tidal flows reduce salinity and can make wetlands net GHG emitters (Kroeger, 2017).

Somewhat counter-intuitively, increased density⁸ in New Jersey's forests threatens to reduce their future capacity to sequester carbon, even putting them at risk of eventually becoming net emitters as forest trees die off and release carbon back into the atmosphere. This is a serious threat for New Jersey's pinelands forests, which have experienced a steady increase in Relative Density Index⁹ over the last century (NJDEP, 2020). The increased density stresses tree species, leaving them more vulnerable to pest species, such as the southern pine beetle. With the unmitigated invasion of pests, tree mortality and commensurate carbon losses are guaranteed (Coulson & Klepzig, 2011).

Business-as-Usual & Current Policy Scenario

Accurate projection of future GHG sequestration levels depends heavily on the future trends in land development and land management. In order to compare the relative impacts of various policy alternatives it is useful to establish a baseline that separates out as many confounding factors as possible, thereby permitting alternatives to be considered on their own. The natural and working lands or "carbon sequestration" sector's Business-as-Usual (BAU) scenario assumes the following circumstances:

- No significant changes in recent land use data
- Emissions from land clearing are roughly held constant due to development being concentrated in already developed or built-up areas of the State.

⁸ Density can be defined multiple ways in a forested community, but for our purposes it refers to the proportion of 'growing space' occupied on a site. Growing space is a theoretical term to describe the available resources on a site available to a given taxa.

⁹ Foresters use the term 'Relative Density Index' (RDI), which is a forest's current proportion of theoretical maximum density, ranging from 0 to 1

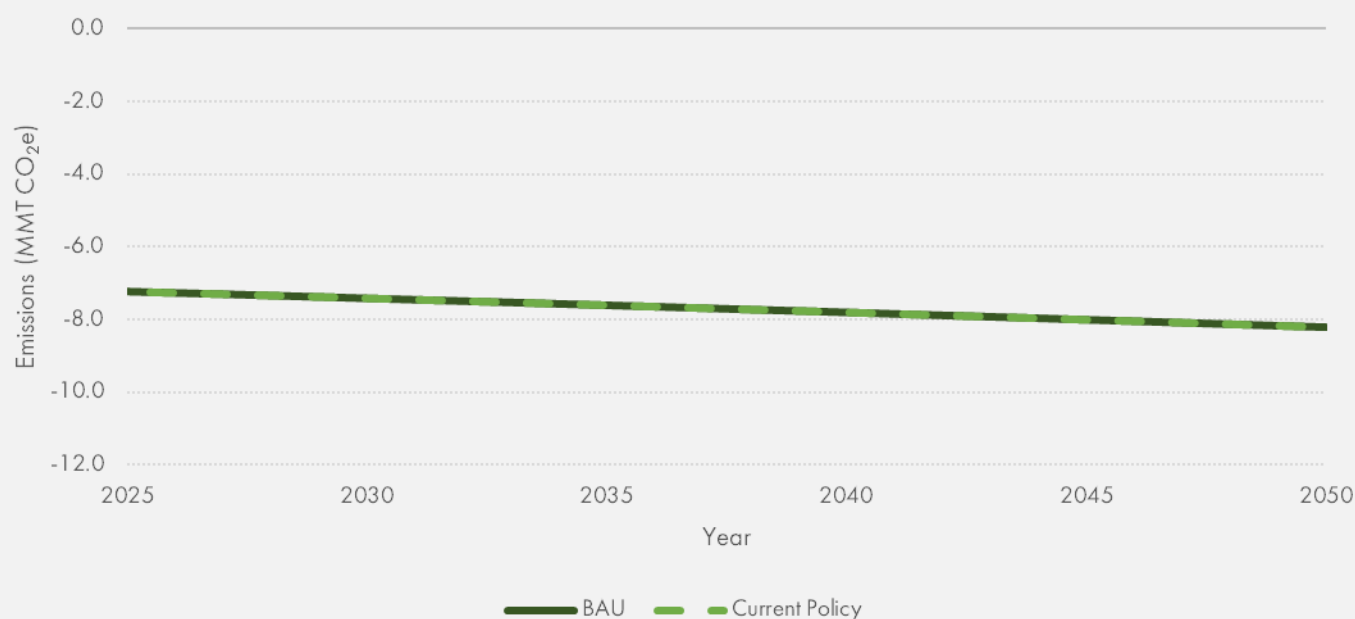
- A continuation of existing State policies and programs that protect and enhance natural carbon sinks

For the purposes of this chapter, the Current Policy Scenario assumed the same circumstances as the Business-As-Usual Scenario.

Under these conditions, annual GHG emissions sequestered from the natural and working lands sector would increase by 1.3 MMT CO₂e, reaching an annual sequestration (removal) of -9.4 MMT CO₂e in 2050. When adding projected GHG emissions released through land clearing (1.0 MMT CO₂e increasing to 1.2 by 2050), net GHG emission removals from Natural and Working Lands (NWLs) in the BAU and Current Policy scenario reach an annual net removal of -8.2 MMT CO₂e by 2050 (Figure 7.2).

Figure 7.2 New Jersey Natural and Working Lands Sector (Net Land Use, Land-use Change and Forestry Removals of GHG emissions 2025-2050 Business-as-Usual & Current Policies Projection (MMT CO₂e).

Emissions sequestered under the BAU & Current Policies scenario increases by -1.3 MMT, from a continuation of policies that protect and enhance carbon sinks and holding emissions from land clearing constant through concentrating development in already-developed areas. However, this would bring the net total sequestration in 2050 to -8.2 MMT, which would not be on track for the State to achieve its economy-wide 80x50 goal.



This projection also does not take into account recent sea-level rise projections, which predict between 2.3 and 4.4 foot sea-level rise increase by 2100 (Kopp, 2019) under an intermediate emissions scenario (as described in IPCC's AR6). The rising sea-level will critically endanger coastal wetlands that currently serve as key carbon sinks. Modeling suggests the State's tidal salt marsh could decline by between 5 and 9% by 2050 (Lathrop & Bognar, 2014).

Critical Existing Carbon Sequestration Policies

The State's open space, farmland preservation and wetland protection policies implemented over the last five decades have resulted in the public ownership of development rights for more than a third of New Jersey's land area, protecting over 1.5 million acres (Open Space Preservation, 2024) (Figure 7.3). Several programs have worked in tandem for the public purchase of development rights for large swaths of land throughout New Jersey. Most notably the Garden State Preservation Trust and Green and Blue Acres programs have received broad public support to preserve open space, farmland, wetlands, and historic resources.

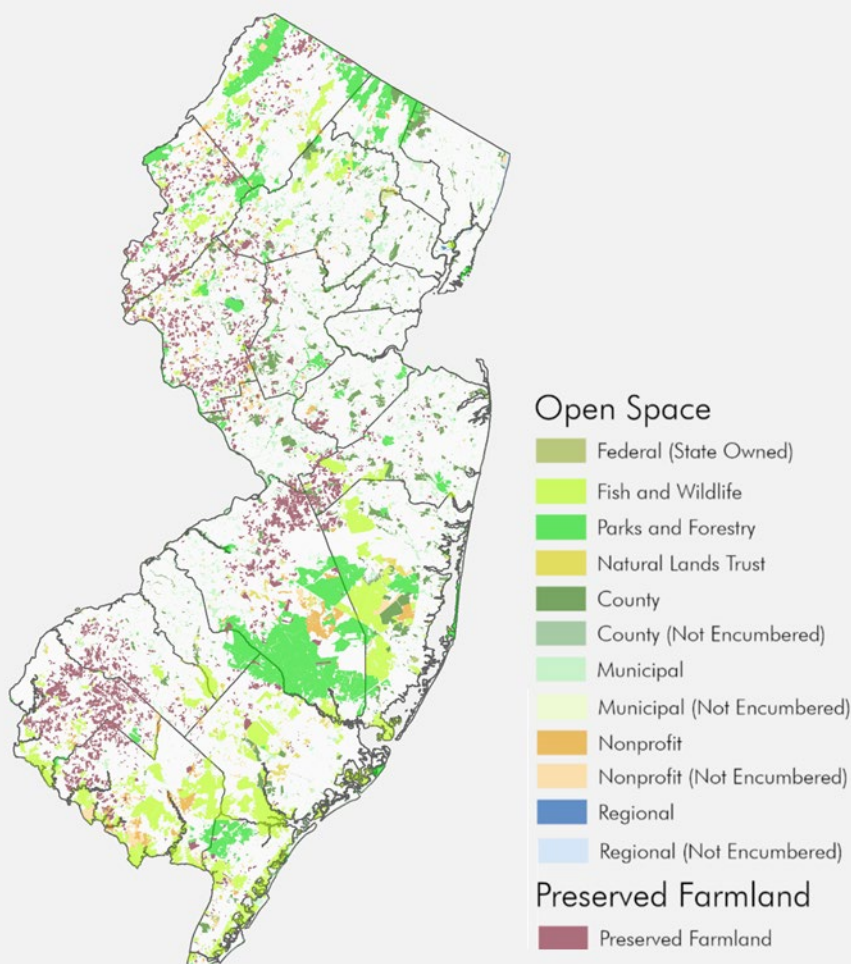
Green Acres Program

The Green Acres Program¹⁰ invests in protecting open spaces, public parks, and outdoor recreational spaces. Since its inception in 1961, the Green Acres Program has preserved over 525,000 acres for State Parks, Wildlife Management Areas, and Nature Preserves. The Green Acres State Land Acquisition Program¹¹ acquires land that has either been offered for sale, donated or bequeathed by

property owners that then becomes part of the system of state parks, forests, natural areas, and wildlife management areas. Facing challenges like rapid land development and climate change, the program has refined its focus to three targeted strategies which includes “acquiring land with high carbon storage potential” to boost climate resilience and ecological benefits provided by forests (NJDEP, 2025).

Figure 7.3 State, Local and Nonprofit Open Space and Preserved Farmland of New Jersey.

NJDEP maintains a geospatial inventory of open space and recreation areas throughout the State that the public can explore as an interactive webmap.



Strategic Planning Efforts

Since the 2020 release of the Global Warming Response Act 80x50 recommendations report (2020 GWRA 80x50 Report), the New Jersey Department of Environmental Protection (NJDEP or Department) has further refined its strategic vision through three key planning documents:

- **State Forest Action Plan** (NJDEP, 2020)

Ten-year strategic plan focused on the State’s forests more broadly, providing a holistic look at what is needed to protect and enhance its forest resources. New Jersey is in the process of updating this plan in 2025.

- **New Jersey Wetland Program Plan** (NJDEP & USEPA, 2022)

Five-year strategic plan focused on the State’s wetlands more broadly, providing a holistic look at what is needed to protect and enhance its wetland resources.

- **Strategy to Advance Carbon Sequestration on New Jersey's Natural and Working Lands** (NJDEP & NJDA, 2024)
Plan focused on carbon sequestration explicitly, establishing key targets by land type, and setting near and long-term goals. This plan hereafter is referred to as the “NWLS”.

Other Relevant Grant Programs and Supporting Research

The NJDEP has also continued to support local stewardship and effective management of trees, forest ecosystems and open space in urban communities through the Urban and Community Forestry Program¹² which disburses grants for conducting tree inventories, developing community forest management plans, implementing priority tree maintenance, removing hazardous trees, hiring professional foresters, and planting street and shade trees.

¹⁰ <https://dep.nj.gov/greenacres/>

¹¹ <https://dep.nj.gov/greenacres/state-land-acquisition/>

¹² <https://www.nj.gov/dep/parksandforests/forest/urbanandcommunity/>

The Department launched the Natural Climate Solutions (NCS) Grant Program¹³ in May of 2022. This program funds on the ground implementation of ‘shovel-ready’ project types which include living shorelines, tidal wetland restoration, tidal flow reconnection, urban forest canopy enhancement, and reforestation and afforestation projects. In January of 2023, NJDEP awarded \$24.3 million in grants to fourteen projects that will enhance carbon sequestration and storage in New Jersey’s forest and tidal wetlands. In April of 2023, the NJDEP in partnership with Sustainable Jersey launched its Trees for Schools grant program¹⁴ which funds the planting of trees on the campuses of New Jersey public schools, county colleges, and state colleges and universities. In July 2025, the Department announced the award of additional Trees for Schools grants bringing the total funds awarded through the program to \$8.8 million, and in August released a notice of funding availability for a second round of NCS grants totaling \$30 million.

NJDEP has also contracted with the Greenhouse Gas Management Institute, using CPRG planning grant funding, to develop a New Jersey specific methodology for estimating land-based sources and sinks of greenhouse gases. The new calculator developed with this methodology applies land use and land cover data, Forest Inventory and Analysis (FIA) data, cutting edge geospatial modeling, and field study data to refine State-specific soil carbon and biomass estimates. Tools developed using this calculator can also explore scaling down the data to assist in project prioritization, and to conduct county-level studies. Simultaneously, the Division of Science and Research (DSR) has embarked on a 2025-2028 research effort to: 1) measure baseline and future carbon sequestration benefits at Natural Climate Solutions Grants sites; and 2) evaluate the carbon sequestration benefits of two commonly utilized restoration techniques. To complete the latter, DSR will select 2-3 beneficial reuse of dredged material and living shoreline sites (4-6 sites total) that were restored at least five years ago and compare the current on-site carbon flux to that of a near-by “no-intervention” control site.



¹³ <https://www.nj.gov/dep/climatechange/mitigation/ncs-grant.html>

¹⁴ <https://www.sustainablejerseyschools.com/grants/trees-for-schools/>



THE PATH FORWARD

The CCAP Scenario projects that by 2050, New Jersey will likely need to maintain its existing carbon sinks and expand sequestration by at least 2 MMT CO₂e in order to meet its climate goals. Modelling of the projected net land use, land-use change and forestry emissions removals from the State's NWLs, assumed that New Jersey could expand its carbon sinks to sequester at least 10.4 MMT CO₂e per year by 2050, which once accounting for emissions from land clearing, would result in at least 9.2 MMT CO₂e in net emissions removed per year in 2050 (Figure 7.4). This modelled growth in the State's natural and working land carbon sinks is based on what appeared possible within the mitigation potential identified in New Jersey's 80x50 report.

2050 SEQUESTRATION GOAL

>9.2 MMT CO₂e

CARBON GAIN ACTIVITIES

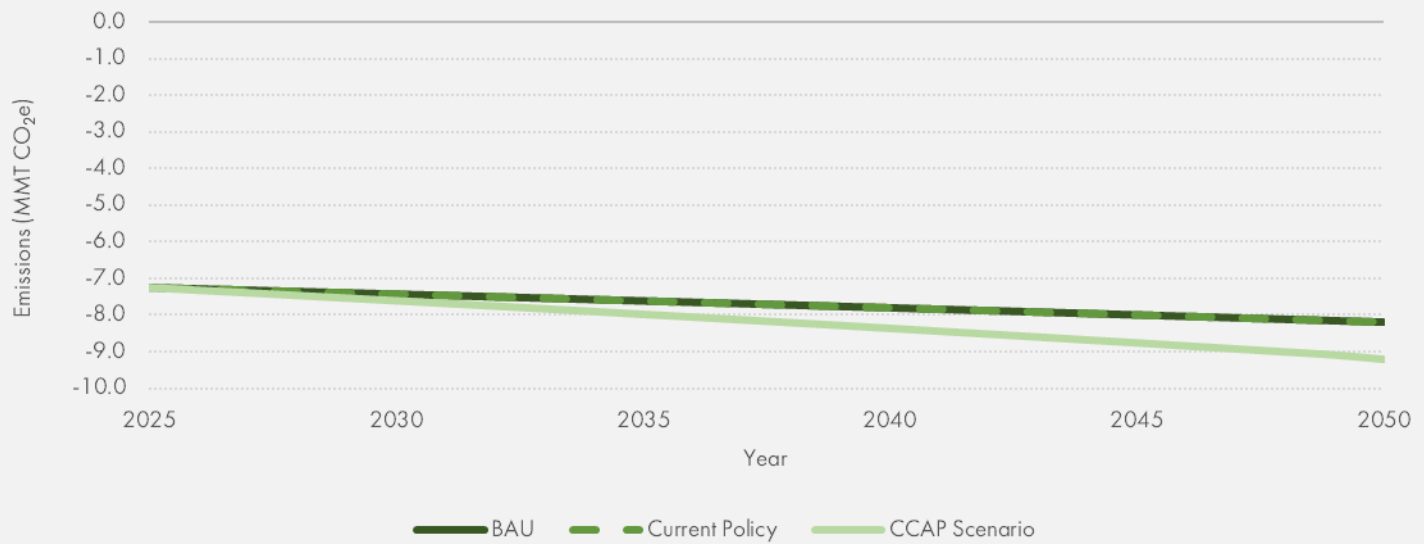
- Reforestation
- Afforestation
- Restoring Tidal Flows
- Cover Cropping
- Open Space Preservation

SEQUESTRATION MEASURES

1. Strengthen and expand existing natural carbon sinks through reforestation, afforestation, and restoration
2. Protect, maintain, and avoid the conversion of natural lands, including 21,000 acres of forested lands, through high-carbon land acquisitions and policies that promote location-efficient development

Figure 7.4 New Jersey Natural and Working Lands Sector Net Land Use, Land-use Change and Forestry Removals of GHG Emissions 2025-2050 in the CCAP Scenario vs. Business-as-Usual & Current Policies (MMT CO₂e).

Continuation and expansion of State policies that enhance and protect carbon sinks as well as more policies that avoid the conversion of natural and working lands to developed uses can increase the State's net carbon sequestration to -9.2 MMT in 2050.



NJDEP staff identified two over-arching carbon sequestration measures that will be necessary to achieve the scale of additional sequestration that is envisioned in the CCAP Scenario:

- **Measure 1:** Strengthen and expand existing natural carbon sinks through reforestation, afforestation, and restoration
- **Measure 2:** Protect, maintain, and avoid the conversion of natural lands, including 21,000 acres of forested lands, through high-carbon land acquisitions and policies that promote location-efficient development

Collectively, continuing existing policies and implementing a combination of policies based on the above strategies will need to accelerate carbon sequestration in the State towards the goal of 10.4 gross emissions or 9.2 MMT CO₂e in net emissions removed per year by 2050, which is about 1 MMT CO₂e more than what is envisioned in the BAU and Current Policies Scenario. Using best available data, NJDEP estimates that implementation of actions described in these measures could provide at least 0.05 MMT CO₂e per year in additional carbon sequestration¹⁵ and 0.74 MMT CO₂e per year in avoided GHG emissions in 2050.¹⁶ However, using the current methodology for sequestration analysis, implementing these CCAP measures leaves about 0.20 MMT CO₂e in additional annual emissions that will need to be sequestered or avoided in 2050 to reach emissions targets envisioned in the CCAP Scenario.¹⁷ Afforestation and reforestation represent the largest opportunities for carbon gains in New Jersey, followed by installing living shorelines that help protect and restore tidal marshes. The measures identified in this chapter lay the groundwork for NJDEP's forthcoming Natural and Working Lands (NWL) Action Plan that will identify and prioritize measurable, achievable, and beneficial actions to meet the goals set forth in the NWLS and this CCAP.

¹⁵ This does not include the carbon sequestration impacts of the other NWL types described in Measure 1 due to data limitations. NJDEP expects the annual carbon sequestered in 2050 to be greater when considering the impact of implementing those other actions.

¹⁶ Additional carbon avoided from other actions described in Measure 2 enabling actions are not included in this estimate due to data limitations. NJDEP expects the annual carbon avoided in 2050 to be greater when considering the impact of implementing those other actions.

¹⁷ This is on top of the assumed 1MMT increase in carbon sequestration that are expected to occur through continuation of BAU and Current Policies scenario assumptions which are based off the mitigation potential identified in New Jersey's 80x50 report.

Carbon Sequestration Measure 1: Strengthen and expand existing natural carbon sinks through reforestation, afforestation, and restoration

New Jersey will need to pursue a series of policies and actions to maintain, restore, and expand its natural and working lands to sequester approximately 10 MMT CO₂e per year by 2050. As outlined in the NWLS, actions that will enable the level of sequestration needed to reach the State's climate goals involve reforestation, afforestation, and restoration. Reforestation refers to the reestablishment of forest cover, while restoration goes beyond tree planting and refers to the process of reestablishing a self-sustaining habitat that closely resembles its natural structure and function. Afforestation refers to the process of establishing trees on land that has lacked forest cover for a very long time, such as abandoned farmland, or land that has never been forested. Collectively these practices help forests grow and regenerate, thereby sequestering carbon from the atmosphere, and storing increasing amounts of carbon as they continue to age and grow.

Restoration is also critical for New Jersey's blue carbon ecosystems, such as salt marshes and seagrass beds. These ecosystems are particularly important in the fight against climate change (Howard, 2014). "Blue carbon" is the carbon stored by the soils and plants in these marine systems. Coastal ecosystems such as tidal marshes and seagrass meadows sequester more carbon per unit area than terrestrial forests and the carbon can be stored for millennia (Pidgion, 2009). Although salt marshes cover only a small percentage of the United States, it has been estimated that they account for 21% of the carbon sequestered by ecosystems (Nellemann, et al., 2009). New Jersey has an estimated 191,178 acres of Blue Carbon resources.¹⁸ However, as these ecosystems are degraded and lost, their carbon sink capacity declines, and existing stored carbon can be released, resulting in emissions of carbon dioxide that contribute to climate change. Modeling shows that between 9 and 19% of the State's existing salt marshes could be lost by 2050 due to sea level rise (Lathrop R., 2019). Furthermore, 67% of New Jersey's shoreline is ranked for vulnerability to erosion as high or very high (NJDEP, 2015). As the soil erodes in these systems, the carbon stored in sediments can be exposed to oxygen and released back into the atmosphere as carbon dioxide (Lovelock, Fourqurean, & Morris, 2017). Thus, it is important that New Jersey also prioritize the restoration of coastal wetlands as another method for combating climate change.

Measure Quantification

Implementing the enabling actions described in this measure will increase the capacity of the State's natural lands to sequester carbon. NJDEP estimates that the projected cumulative carbon sequestrations benefits from afforesting 4,000 acres of non-forested lands; planting cover crops on 40,300 acres of harvested and cropland pasture lands; installing 202,000 feet of living shorelines; and planting 1 million street or shade trees by 2050 is 0.677 MMT CO₂e (Figure 7.5).¹⁹ However due to data limitations, NJDEP was not able to estimate the full carbon sequestration impact of all enabling actions described in this measure.²⁰

¹⁸ Based on land cover calculations completed by the NJDEP Bureau of GIS, January 2020.

¹⁹ The additional GHG benefits from increasing other NWL types described in Measure 1 enabling actions were not factored into this estimate due to data limitations.

²⁰ The impact of the following actions are not factored into the estimate: reforestation of at least 2,000 acres of degraded forests; redevelopment of at least 1,000 acres (200 sites) of brownfield sites into new green space; restoration of 20,000 acres of Atlantic White Cedar Swamps; completion of 45 tidal reconnection projects; and the restoration and replanting of 25 acres/yr of submerged aquatic vegetation in 2050. NJDEP expects these actions to provide additional carbon sequestration benefits by 2050. Tidal reconnection and submerged aquatic vegetation restoration are expected to have the greatest impact on additional sequestration among actions not quantified under the measures. Restoration of 20,000 acres of Atlantic White Cedar Swamps; redevelopment of brownfield sites could also provide net sequestration or carbon storage gain depending on the type or use of new green space that is developed.

Figure 7.5. Estimated Cumulative Emissions Sequestered by 2050 from Measure 1, strengthen and expand existing natural carbon sinks through reforestation, afforestation, and restoration, by action.
Cumulative carbon sequestration benefit by 2050 from implementing five of the enabling actions of this measure is projected to be 0.677 MMT CO₂e.



Priority Enabling Actions

Under this measure, New Jersey will take a number of actions to increase natural and working land acreage and expand the total carbon sequestration capacity of the State’s existing natural carbon sinks.

Enabling Action 1.1 *Afforestation of at least 4,000 acres*

NJDEP will identify and plant at least 4,000 acres of non-forested land to a forested condition with appropriate species by 2050. Afforestation expands the overall carbon pools by establishing more forested areas that can continuously pull carbon dioxide out of the air with storage potential of hundreds of years. Establishing forests on abandoned agricultural lands and other non-forested lands has the greatest potential for creating net carbon sequestration (NJDEP, 2020). The State of New Jersey has created and preserved forested land at a consistently high rate up until this point. With buildout anticipated in some counties in the near future, there is limited land remaining within the State that is appropriate for afforestation or reforestation, and the targets aim to reflect that limitation. Near term steps to achieving this action include: researching the most efficient way to transform abandoned agricultural lands/brownfields/other non-forested spaces into ecologically functioning forests; identifying plant-able spaces in urban settings for potential afforestation; targeting outreach and education towards consulting foresters and private landowners with the capacity to afforest property; creating afforestation Best Management Practices to increase the success of public and private afforestation projects; and increasing production of seedlings at the State nursery to supply sufficient trees for planting. Programs like the NCS Grant program have already begun funding afforestation efforts and could be one essential mechanism for facilitating afforestation projects throughout the State. New Jersey could incentivize agricultural landowners to establish forests in areas where field production is no longer financially feasible. Agricultural landowners could also be dissuaded from pursuing land-use changes that increase their carbon footprints by highlighting the opportunities for financial benefits provided by joining carbon markets.

Enabling Action 1.2 *Reforest at least 2,000 acres of degraded forests*

NJDEP will identify and restore 2,000 acres of degraded forests across all forest ownership types by 2050. This is in addition to reforesting at least 40 State-owned sites by 2050. Reforestation is the practice of reestablishing forest cover where it previously existed, either through natural or artificial methods assisted by human intervention such as plantings or the removal of invasive species. NJDEP will identify degraded forests where ecosystem function is disrupted and plan

to restore or enhance them to a forested condition that will efficiently capture and store carbon long-term. A large portion (43%) of forests in New Jersey are on privately owned land (US Forest Service, 2023). Reforesting privately owned lands can increase carbon sequestration beyond what is attainable by focusing solely on publicly owned land. Near term steps to achieving this action include: assisting homeowners in restoring degraded forests on their properties by providing education and financial incentives; encouraging non-profits and other organizations to survey their land-bases for forests in need of restoration or land that has the potential to be forested; and increase outreach and training programs to private landowners to encourage participation in forest management programs on private lands such as the NJ Forest Stewardship Program.

An additional opportunity to increase sequestration within New Jersey's forests is by planting new trees in forest areas that are currently understocked. The U.S. Climate Alliance estimates found that restocking understocked forests in New Jersey could provide up to 281,000 MTCO₂e per year (USCA, 2018). This analysis was based on estimates by the United States Forest Service Forest Inventory and Analysis (USFS FIA) of existing public and private forestland that is currently understocked.²¹ The U.S. Climate Alliance found that restocking forests can be achieved at less than \$20/MTCO₂e. Stewarding both new and existing forests across the State is an important part of ensuring that trees and forests remain viable carbon sinks.

Enabling Action 1.3 *Plant 1,000,000 street or shade trees*

New Jersey aims to plant 250,000 street or shade trees by 2030 and increase this number to a total of 1,000,000 trees by 2050. Urban tree planting can maximize carbon benefits by planting the right tree species in the right places and planting them on open soils or enhanced soil treatments. Urban and street tree placement is of the utmost importance as it ensures that tree growth and lifespan will not be impaired by power and phone lines, or by impervious surfaces like roads and sidewalks. New Jersey will continue to leverage and expand existing funding sources and programs that support the planting and management of the State's urban and community forests. This includes leveraging programs such as the Urban and Community Forest Program (NJUCF), the Natural Climate Solutions and Trees for Schools grants, and enrolling more municipalities into the Urban Stewardship program (currently about 45% of the State's municipalities have approved forest management plans). Under the NJUCF Community Forest Management Plan Guidelines document,²² the NJDEP provides resources for municipalities to inventory and assess trees in their jurisdictions. Near-term enabling actions also include implementing a consistent State-wide urban tree/forest inventory program and increasing production of seedlings at the State nursery to supply sufficient trees for planting.

Enabling Action 1.4 *Redevelop at least 1,000 acres (200 sites) of brownfield sites into new green space*

In urban areas of New Jersey there is a large inventory of vacant residential lands, brownfields, and contaminated sites available for improvement. Brownfields are vacant or underutilized former industrial or commercial sites that are presumed to be contaminated. They are typically characterized by impervious surfaces, abandoned buildings, and compacted soils. Under these conditions, there is little carbon sequestration, and the developed land does not serve a productive social or economic purpose. There are currently about 14,000 known contaminated sites in the State, and potentially over 10,000 currently vacant or underutilized commercial or industrial brownfield sites. Remediating and restoring these sites as natural working lands with vegetation is one potential option for these sites, especially those that may face barriers in being redeveloped for other land uses such as housing or commercial development. This type of land conversion from brownfield to green space eliminates sources of pollution while increasing the amount of carbon sequestered per unit area through new vegetation growth and enhanced soils. NJDEP could expand various funding opportunities that currently assist with the redevelopment of brownfields such as the Environmental Claims Administration, Hazardous Discharge Site Remediation Fund, Petroleum Underground Storage Tank fund, and NJDEP's Technical Assistance Grant Program. The Department should also work to update the existing inventory of brownfield sites to denote which could be targeted for open space creation. NJDEP should also work to address concerns about

²¹ Forests with stocking levels below 25% were excluded from this analysis to avoid double counting with the reforestation pathway.

²² https://www.nj.gov/dep/parksandforests/forest/urbanandcommunity/docs/CFMP_Guidelines_Guidance.pdf

policies that disincentivize clean-up of brownfields and infill redevelopment of vacant lands. Public stakeholders noted in the community listening sessions that for many overburdened municipalities, paying required clean up assessment fees can be both burdensome and a disincentive to assessing sites under the fear that if contamination is found they will face ongoing added costs that they don't have adequate funding or staff capacity to support. Participants urged the State to explore structural levers it could use to help address these issues and bring more of these properties back into constructive use.

Enabling Action 1.5 *Plant cover crops with harvested and cropland pasture lands on 40,300 acres*

Planting specific crops that cover the soil rather than keeping them fallow or bare is an agricultural land management practice known as “cover cropping.” It remains one of the most widely recognized and accessible soil health practices. Cover crops increase organic matter, improve nutrient retention, reduce erosion, and provide measurable benefits for water quality and carbon storage. Cover crops not only help to sequester more carbon, but they also help improve soil health by reducing compaction, increasing porosity and water retention, and enhancing microbial diversity, which in turn reduces the need for fertilizers. Economically, cover crops can protect from market volatility instead of relying solely on cash crops and reduce the need for costly fertilizers and pesticides.

New Jersey will also continue to pursue other ways to improve carbon sequestration in the agricultural sector. For livestock, pasture restoration, and fallowed cropland, such practices include rotational grazing, seeding select areas with warm-season grasses, and diversification of cover crop mixes with perennial grains. Agro-forestry is an approach that utilizes numerous management practices, combining the cultivation of trees and shrubs with crops and livestock. These intensive practices are designed to allow additional plant growth on farms to sequester more carbon, creating many ancillary benefits for crops, livestock, and the environment. Recommendations for agro-forestry include facilitating research of commercial scale projects and researching the net-GHG benefits of agroforestry. When thoughtfully implemented, agroforestry can increase soil carbon, improve water retention, and buffer climate extremes, while creating alternative income streams through timber, fruit, nuts, or specialty products.

Despite strong agronomic value, cover cropping can be cost-prohibitive for many farmers, especially when land is taken out of cash crop production. Barriers to adopting cover crops include increased input costs, such as those for seed, fuel, labor, and added management complexity. NJDA should collaborate with the NJ Forest Service and the United States Department of Agriculture (USDA) Natural Resource Conservation Service (NRCS) to develop and encourage producer enrollment in existing programs that provide technical and financial assistance for the implementation of agro-forestry practices on farms. There are many practices that can be implemented within an agro-forestry system, often times with multiple practices incorporated into the same site. These practices include ally-cropping, silvopasture, riparian buggers, forest farming, and windbreaks.

Recommendations include securing or providing funding assistance for practices that increase soil health, climate-smart practices (including cover cropping), and insuring farmers who change practices do so in ways that increase carbon sequestration. NJDA is developing a State program to promote agroforestry and management of “appurtenant” woodland on farms. One additional way to adapt to a changing climate is to initiate a State-specific breeding initiative for cover crops and cash crops. Selecting breeds that are best suited to New Jersey’s current and future climate will help to ensure the success of these crops. NJDA should gather baseline data on where climate-smart practices are already occurring, provide education and outreach to interested producers, and provide financial incentives for adopting rotational grazing and seeding warm-season grasses.

Enabling Action 1.6 *Increase cover of salt marsh vegetation by at least 3,000 acres*

Tidally influenced wetlands are precariously located between the ocean and upland. They exist in a narrow band of elevation and are susceptible to increasing rates of sea level rise. Without action, tens of thousands of acres of tidal wetlands are expected to be lost due to sea level rise and erosion (NJDEP & NJDA, 2024). When these habitats are lost, they not only lose their ability to sequester carbon, but also have the potential to become significant sources of greenhouse gases as stored carbon is released back into the atmosphere. NJDEP will identify marshes with large areas of vegetation loss and add those areas to the Coastal Ecological Restoration and Adaptation Plan (CERAP) so that

partners can begin to develop projects, some of which could utilize State grant funding (such as NCS) to implement restoration.

Enabling Action 1.7 *Install at least 202,000 feet of living shorelines*

Living shorelines address the loss of vegetated shorelines, beaches, and habitat in the littoral zone by protecting, restoring, or enhancing these habitats. Living shoreline projects focus on protecting against the erosion of carbon rich soils in tidal wetlands and often add vegetation which sequesters more carbon. By protecting wetlands from wave action by installing living shorelines, carbon that has been accumulating for centuries can be protected from re-emission by storms and other erosive forces. NJDEP will prioritize the development of living shoreline projects in areas with high erosion rates and add the sites into the CERAP so partners can begin to develop projects, which could utilize State grant funding (such as NCS) for installation.

Enabling Action 1.8 *Restore 20,000 acres of Atlantic White Cedar Swamps*

Atlantic white cedar swamps are a type of freshwater wetland forest with soils that are saturated at least seasonally throughout the year. New Jersey's Atlantic white cedar forests provide tremendous benefits to the hydrology and water quality of the Pinelands, a region specifically protected for its ground and surface water resources. The cedar helps to moderate base flow and acts as a filter for nutrients in water. Peat formed in the muck soils of cedar swamps removes and stores nutrients and pollutants from the water including significant quantities of carbon, providing a stable long-term carbon sink. These swamps are also an ecologically significant habitat for several State and federally-listed plant and animal species. However ongoing sea-level rise leading to saltwater intrusion, ditching and wetland drainage, impoundment due to roads, flooding for agricultural water storage, and flooding from rebounding beaver populations all contribute to severe declines which have left less than 25,000 acres remaining in the State. Atlantic white cedar, which once spanned from southern Maine to northern Florida, has experienced extensive mortality throughout its entire historic range due to these issues, making the cedar swamps of the New Jersey Pinelands one of the last cedar strongholds in the United States. The New Jersey Forest Service has launched the Atlantic White Cedar Restoration Project in order to combat the continual forest decline. Through this project, the New Jersey Forest Service seeks to restore, reinforce, and enhance 1,000 acres of cedar forest per year for 10 years, for a total of 10,000 acres. The State will need to continue this work and expand restoration by another 10,000 acres through 2050 to ensure the valuable ecosystem services of the Atlantic White Cedar are not lost.

Enabling Action 1.9 *Complete 45 tidal reconnection projects to increase salinity from fresh to salt*

Tidal flow in wetlands can be restricted or completely blocked by dikes, undersized culverts, roads, or other human made constrictions. This can lead to artificially low salinity in wetlands, which can increase the release of methane (Poffenbarger, Needelman, & Megonigal, 2011), and lower elevations, which can decrease vegetation cover. Projects that reconnect tidal flows can increase net sequestration when they are designed to increase both the cover of vegetation in salt marshes via increased sedimentation and/or planting; and to restore tidal flow that will greatly increase the salinity of the marsh to at least above 5ppt or preferably >18ppt. Warnell and Olander (2020), identified about 10,100 acres in New Jersey where hydrologic connection projects could be targeted to reduce methane emissions. NJDEP should survey impounded marshes that would naturally be saline if the impoundments were removed and create a list of potential project sites. These sites can be added to the CERAP²³ and partners can begin to develop projects (Rutgers University & NJDEP, 2021).

Enabling Action 1.10 *Restore and replant 25 acres/yr of SAV in 2050*

Among New Jersey's aquatic habitats, submerged aquatic vegetation (SAV) and shellfish beds/reefs are the two most essential for carbon sequestration and storage. Coastal SAV beds, like saltmarshes and mangroves, help to mitigate climate change impacts. They are capable of taking up carbon dioxide from the atmosphere and buffering ocean acidification. The full benefits of seagrasses in mitigating climate change impacts continue to be researched to

²³ <https://njrestors.rutgers.edu/nj-cerap/>

strengthen these services. Successful restoration will offer a potential to sequester more carbon. However, conservation should be prioritized over restoration, as restoration can be costly and challenging. Additionally, more research is needed to understand how restoration practices for SAV can be successfully implemented within the State. Near term actions the State will pursue include: conducting research on best practices for SAV restoration within New Jersey waters; developing SAV restoration guidance for best practices, adaptive management strategies, and success criteria; and creating an SAV alliance advisory group to better coordinate SAV conservation and restoration efforts throughout the State and the region. The SAV restoration targets will be refined after further data is collected via monitoring.

Table 7.3. Measure 1 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
<i>Forested Lands</i>		
Afforest at least 4,000 acres by 2050, Including 1,600 acres by 2030	Ongoing + Long Term	NJDEP, Local Governments
Reforest at least 2,000 acres of degraded forest by 2050 Including 800 acres by 2030	Ongoing + Long Term	NJDEP, Local Governments
<i>Developed Lands</i>		
Plant 1,000,000 street or shade trees by 2050 Including 250,000 street/shade trees by 2030	Ongoing + Long Term	NJDEP, NJDA, Local Governments
Redevelop at least 1,000 acres (200 sites) of brownfield sites into new green space by 2050	Ongoing + Long Term	NJDEP, Local Governments
<i>Agricultural Lands</i>		
Plant cover crops with harvested and cropland pasture lands on 40,300 acres by 2050	Long term	NJDA, NJDEP, Local Governments
<i>Wetlands</i>		
Increase cover of salt marsh vegetation by at least 3,000 acres by 2050	Ongoing + Long Term	NJDEP, Local Governments, NGOs, and Federal Government
Install at least 202,000 linear feet of living shorelines by 2050 Including 39,000 feet by 2030	Ongoing + Long Term	NJDEP, Local Governments, NGOs, and Federal Government
Restore 20,000 acres of Atlantic White Cedar Swamps by 2050	Long term	NJDEP, Local Governments, NGOs, and Federal Government
Complete 45 tidal reconnection projects to increase salinity from fresh to salt by 2050. Including completion of 1 tidal reconnection project per year (total of 6) by 2030	Ongoing + Long Term	NJDEP, Local Governments, NGOs, and Federal Government
<i>Aquatic Habitats</i>		
Restore and replant 25 acres/yr of SAV in 2050	Long term	NJDEP, Local Governments, NGOs, and Federal Government

Table 7.4. Measure 1 Implementation Approach.

Plan to Leverage Funds

Cost of Measure

High

Secured Funding

New Jersey will continue to support carbon sequestration efforts through its existing funding sources such as, Regional Greenhouse Gas Initiative proceeds, and via targeting federal grants. New Jersey has secured the following funds towards implementation of this measure and its enabling actions:

- NJDEP and several municipalities were awarded a [USDA Inflation Reduction Act \(IRA\) - Urban and Community Forestry Grant](#) to support urban tree planting projects.
- [RGGI Proceeds](#) offer grants to New Jersey private landowners, non-profits, local governments, school districts and other entities through the [Natural Climate Solutions](#) and [Trees for Schools](#) programs.
- [NJUCF Stewardship Grant](#)
- [Blue Acres program](#)
- [Green Acres program](#) and the [Green Acres' State Land Acquisition Program](#)
- [Section 319h grants](#)
- [NJ Wetlands Mitigation Bank](#)
- [State Agriculture Development Committee's \(SADC\) Farmland Preservation Programs](#)

Funding Gaps and Opportunities

All enabling actions described for this measure would benefit from additional funds. More funds would allow New Jersey to expand and implement these efforts on a wider scale, achieving deeper carbon sequestration from its natural and working lands. The State has applied to or intends on applying to several federal grants to support its ongoing carbon sequestration efforts under this measure, including, but not limited to the:

- [NRCS- Conservation Stewardship Program \(CSP\)](#)
- [NRCS- Environmental Quality Incentive Program \(EQIP\)](#)
- [USFW National Coastal Wetland Conservation Grants](#)
- [Federal National Oceanic and Atmospheric Administration \(NOAA\) grants](#)

New Jersey will continue to pursue federal funding opportunities as they become available to build upon these efforts.

New Jersey should explore additional funding mechanisms to facilitate afforestation, reforestation and restoration of forested lands, tidal wetlands and aquatic resources. Potential supportive funding structures could include expansion of existing State compensatory mitigation through in-lieu fee or mitigation bank programs where permittees pay a sponsor to restore, create or enhance forest, wetland and aquatic resources. [The New Jersey Wetlands Mitigation Council](#) manages the State's current, in-lieu fee mitigation program for wetlands. While predominantly focused on compensatory mitigation for freshwater wetlands, this program also involves mitigation for all coastal wetland impacts, required under the State's Coastal Management Rules. This includes impacts to intertidal and subtidal shallows, shellfish habitat, submerged aquatic vegetation habitats. This type of program and regulatory framework could be expanded or adapted to pursue forest-specific biodiversity, climate resilience, afforestation and restoration goals. Maine, North Carolina and Washington are other States that have these types of programs which may also provide grant funding to entities like municipalities and non-profit organizations to facilitate afforestation or restoration (USCA, 2025).

Geographic Scope

Statewide

Authority to Implement

Subject to further legal review:

NJDEP and NJDA have the authority to support policy and programming and take actions to maintain and increase natural carbon sinks in the State. See, e.g., N.J.S.A. 4:1C-11, 4:10-25.10, 13:1D-9, 13:1L-4. Local governments also have authority to implement supporting projects.

Metrics for Tracking Progress

Refinement of the State's natural and working land inventory that will occur with CPRG planning grant funds will inform the long-term tracking of actions implemented under this measure. In addition, NJDEP will continue tracking:

- the number of trees planted from each of its various grant programs that fund street and shade tree planting
- the number of acres of forest that projects plan to restore
- the number of feet of living shorelines the projects propose to install
- the number of vegetated salt marsh added
- the grant project types awarded in the NRCS program

NJDA will track enrollment in CCSP and contracting with EQIP. NJDA will collect location, acres of implementation for each agriculture best management practice including cover crop planting, soil tests, and run the COMET model.

The Conservation Cost Share Program (CCSP), administered by the New Jersey Department of Agriculture (NJDA), is presently inactive due to insufficient programmatic funding. In an effort to reinstate the program, the NJDA's Division of Agricultural and Natural Resources submitted a proposal to the CPRG-Implementation Grant in April 2024. However, the application was not selected for funding. The USDA Natural Resources Conservation Service (NRCS) restricts access to project and contract information exclusively to the individuals directly engaged in contractual agreements with the agency. Any request by an external entity to obtain conservation planning documentation must be accompanied by formal written consent from the contract holder. As a result, NJDA faces significant limitations in its ability to track and verify the implementation of conservation practices funded through NRCS programs.

Carbon Sequestration Measure 2: Protect, maintain, and avoid the conversion of natural lands, including 21,000 acres of forested lands, through high-carbon land acquisitions and policies that promote location-efficient development

Planting and establishing new carbon sinks, while critically important, takes time. New trees, forests or restored tidal wetlands will need many years of growth until they can sequester and store carbon at the rates of mature, existing carbon sinks. Avoided conversion helps us to protect our forested lands and has the greatest potential for carbon sequestration benefits, as it keeps trees alive and sequestering carbon. Between 2007 and 2015, New Jersey forest lands were being converted to non-forest uses at an average of approximately 4,051 acres per year (Lathrop & Bogнар, 2016). FIA data shows that the average acre of New Jersey's forest stores approximately 374 MT CO₂e per acre, meaning that every acre not converted to non-forest use protects those 374 MT CO₂e of stored carbon plus the approximately 2 MT CO₂e that are sequestered per acre per year that otherwise would have been lost to conversion (NJDEP & NJDA, 2024).

Therefore, avoiding the loss and conversion of existing natural lands must be a critical piece of the State's carbon sequestration strategy for achieving its overall 2050 climate goals. One way New Jersey intends to achieve this net-increase in carbon sinks by 2050 is to avoid the conversion of approximately 21,000 acres of forested lands to non-forested uses by 2050, primarily through land acquisitions and programs that facilitate and incentivize the long-term conservation of private lands. New Jersey should also explore other strategies and policies that will help avoid the conversion of other natural lands such as agricultural, grasslands, and wetlands to higher-emitting land uses like residential, commercial, or industrial development. The State should consider the adoption of additional smart growth policies and statewide land use reforms that would help limit the development of natural lands (reduce land clearing) and help concentrate new development in already developed or built-up areas (infill development). Finally, New Jersey must implement proactive "carbon defense" and forest management practices that protect critical carbon pools against increased risk of wildfire, invasive species, pests, disease, and saltwater inundation.

Measure Quantification

Using the estimates from Forest Inventory and Analysis data cited in the NWLS, NJDEP estimates that avoiding the conversion of approximately 21,000 acres of forested lands to non-forested uses could avoid roughly 7.7 MMT of CO₂e emissions and sequester an additional total of 308,000 MT CO₂e by 2050 (Figure 7.6 and 7.7).²⁴ This estimate does not take into account the additional benefit from avoiding the GHGs emitted from more energy intensive and higher-emitting land uses such as from car-dependent, commercial or residential development that could take the place of forest lands. The estimate also only quantifies the potential benefit of avoiding conversion of forested lands. New Jersey will reduce and sequester additional GHGs through avoiding the conversion of wetlands, agricultural lands, and aquatic resources as well.²⁵

Figure 7.6. Estimated Annual GHG Emissions Sequestered and Avoided from Measure 2.

Annual emissions avoided in 2050 from preventing 21,000 acres of forested lands from being converted to non-forest lands is -0.74 MMT CO₂e. Annual additional GHG emissions sequestered in 2050 from avoiding the conversion of 21,000 acres of forested lands to non-forested lands by 2050 is much smaller at, -0.004 MMT CO₂e.

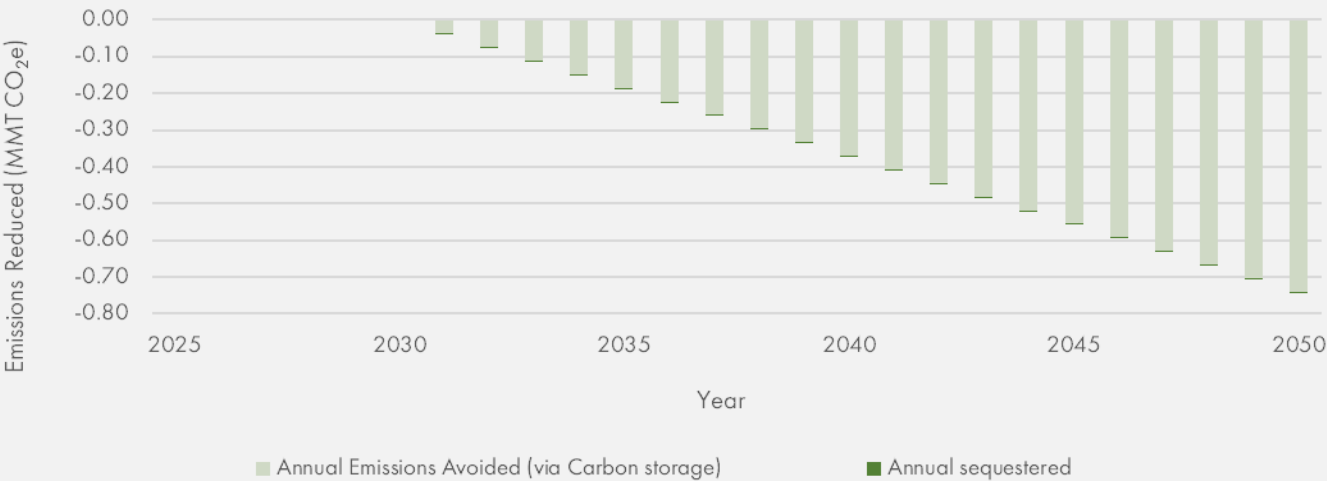
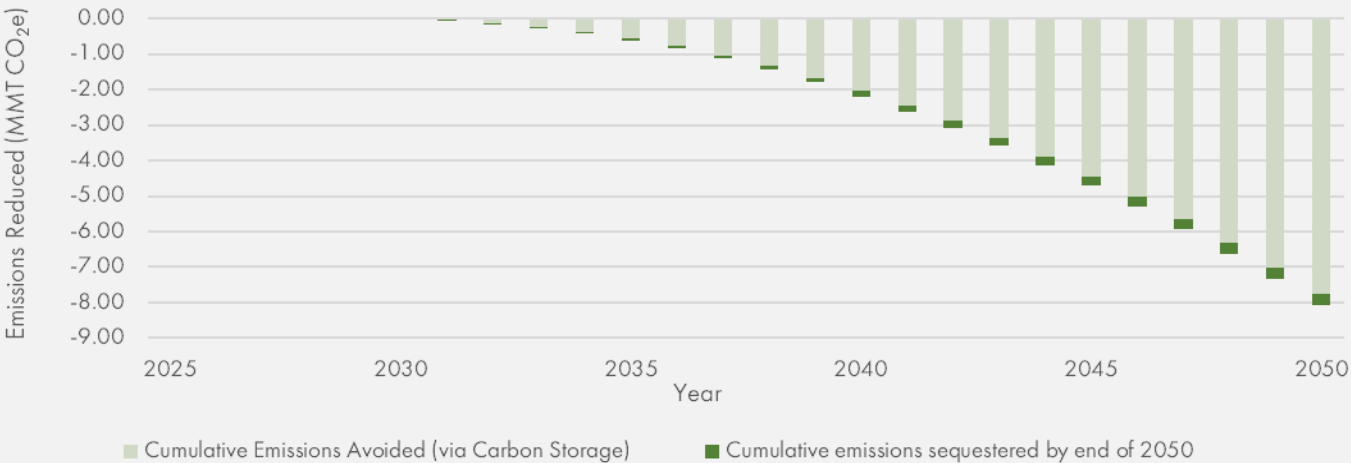


Figure 7.7 Estimated Cumulative GHG Emissions Sequestered and Avoided from Measure 2.

NJDEP estimates that avoiding the conversion of approximately 21,000 acres of forested lands to non-forested uses could avoid roughly 7.7 MMT of CO₂e emissions and sequester an additional total of 308,000 metric tons of CO₂e by 2050.



The additional GHG benefits from avoiding the conversion of these other NREL types were not included into this estimate due to data limitations.

Priority Enabling Actions

Under this measure, New Jersey identified five critical enabling actions.

Enabling Action 2.1 *Continue and expand State-led, high-carbon land acquisitions*

To achieve the carbon sequestration targets set out in the NWLS, the State will need to, on average, prevent the conversion of at least 840 acres of additional forested lands from being converted into non-forest (higher emission) uses each year through 2050.²⁶ Existing State programs like Green and Blue Acres that acquire and preserve land could act as a primary mechanism for the State to decrease the annual conversion rate of forested lands to non-forested uses. The Green Acres State Land Acquisition program recently identified acquiring land with high carbon storage potential as one of its three strategies of focus. To that end, an internal mapping tool was developed to help identify and prioritize private lands that may be ideal properties for land acquisitions based on the amount of stored carbon in aboveground biomass. With approval from the Garden State Preservation Trust, the Green Acres State Land Acquisition program is utilizing this tool and will be seeking to target these priority lands for acquisition. NJDEP could also explore revising Green Acres regulations to preserve forested uses.

Enabling Action 2.2 *Facilitate and incentivize long-term conservation and stewardship of private lands*

While the State expands its current efforts to acquire more high-carbon lands and conserve them in perpetuity for use as public parks, forests, and wildlife management areas, New Jersey should also continue to pursue and expand programs that involve incentivizing private landowners to agree to maintain their forested or agricultural lands, which both ensure their sequestration benefits in the long term and provide numerous other benefits to New Jerseyans. Private landowners in New Jersey own about 43% of all forested lands in the State. These forests are at a higher risk of conversion to non-forest uses like urban development because they are under fewer protections than government-owned forest land. Data from the 2018 National Woodland Owners Survey indicate that 93% of private family landowners in New Jersey had moderate to great concerns about the cost of property taxes, 82% had moderate to great concerns about keeping land intact in future generations, and 49% of private family landowners responded that they would sell their land if offered a reasonable price (Butler, et al., 2021). While current State forestry programs such as Woodland Assessment and Forest Stewardship help to mitigate some of this risk by providing property tax breaks to certain private forest landowners that manage their forests (N.J.A.C. 7:3, 2017); (N.J.A.C. 18:15, 2009), there are still losses to these programs mainly through development and fragmentation as properties are split up into smaller units.

New Jersey should work to increase enrollment of private landowners into the forest stewardship and Farmland Assessment programs which also provides technical assistance and active involvement in environmentally responsible forest management practices. Increasing education and awareness of these programs, and about forest management in general, to private landowners through targeted outreach would also assist in increasing stewardship and conservation of private forests in the State to keep them as forests. Another possibility is for New Jersey to explore the establishment of voluntary forest carbon offset markets on private lands. Voluntary carbon offset markets allow landowners to sell the carbon sequestered in their forest to another entity to offset emissions made elsewhere. NJDEP plans to continue monitoring the potential and appropriateness of developing carbon markets on State lands and to continue to share accurate information about carbon markets to private forest landowners. The income from potential State land carbon credits could be used to fund forest management activities on State lands.

While not likely to increase forest carbon storage, another possibility for enhancing forest management highlighted by community stakeholders during the listening sessions held to collect input on this plan, is exploring State-led support and guidance for forest stewardship through sustainable foraging which can aid biodiversity by facilitating knowledge-sharing about how to care for plants, forests, and meadows. Currently, foraging is prohibited on State park and forest lands. Foraging, if done in a sustainable manner, can aid in preserving important native species and habitats that

²⁶ The DEP's *Strategy to Advance Carbon Sequestration on New Jersey's Natural and Working Lands* (2024) sets a target of maintaining conversion of forested lands to non-forest uses at 4,000 acres/year until 2030 and reducing annual conversion of forest to non-forested uses to 2,000 acres per year by 2050. The 840 acres/yr figure represents the annual average of the difference between the total acres of forested lands converted if the current rate of loss continues unabated until 2050 and the total acres of forested lands converted assuming the annual rate of converted acres is held constant at the current rate until 2030 at which point New Jersey begins avoiding conversion at a linear annual rate to reach the target rate of 2,000 acres/yr in 2050. This difference is approximately 21,000 acres by 2050.

increase forest health (Teixidor-Toneu, et al., 2025). Educational and cultural experiences teaching the values of stewardship may increase public support for conservation, forest management and tree planting more broadly. NJDEP could explore ways to partner with Indigenous communities such as the Ramapough Lenape Indian Nation, the Nanticoke Lenni-Lenape, and the Powhatan Renape Tribes in the State and region, as well as the New Jersey Commission on American Indian Affairs to develop a task force that would make recommendations for legislative or regulatory reforms, State guidelines, and educational programming for fostering sustainable foraging and associated stewardship practices.

Enabling Action 2.3 *Explore additional, Statewide smart growth land use reforms that limit the development of natural lands and concentrate development in already developed or built-up areas*

Potential statewide land use reforms and regulations described in the Wholistic, Cross-sector Approaches chapter (Chapter 8) of this plan that encourages location-efficient, infill development and increased density in existing developed areas would help limit the loss of natural and working lands that act as carbon sinks.

In addition to exploring the adoption of various Statewide smart growth land use reforms, the State could further facilitate the transfer of development rights (TDR) for NWLs. TDR establishes conservation easements that can help ensure carbon storage and sequestration benefits of NWLs. This occurs by allowing developers to buy the development rights from landowners in “sending areas” (such as farmlands, forested areas, wetlands or sensitive lands) which allows them to build at higher densities in “receiving areas.” Once the development rights of a property are sold the land is permanently restricted from further development. Through TDR private landowners of NWLs can earn additional income from their lands without needing to convert them to higher-emitting land uses, while focusing new development in already developed areas in ways that can also be more compact, walkable, and less-car dependent. New Jersey State law authorizes municipalities and counties to establish TDR programs (N.J.S.A. 40:55D-13.7 et. seq., 2004). Municipalities that have established development transfer ordinances may use the State TDR Bank, establish their own TDR bank, or use a county-managed bank, if available, to facilitate development rights transfers within their jurisdiction (NJ Future, 2010). Successful TDR programs in the State have been established in Chesterfield and Lumberton Townships, as well as in Burlington County and in the Pinelands region of South Jersey (NJ Future, n.d.). However other TDR efforts have faced various obstacles including difficulties in finding receiving districts, requiring significant up-front investment by municipalities, and receiving districts not having the needed water, wastewater, or roadway infrastructure in place or the needed development permits. New Jersey could revisit the detailed recommendations of the New Jersey TDR Task Force which included exploring ways to make regional TDR programs viable. Recommendations also included considering regulatory reforms that would support receiving districts and creating incentives for developers which could include exemption from sales and use taxes on construction materials and provision of priority funding for affordable housing subsidies to TDR receiving districts (NJ Future, 2010).

Another strategy is expansion of “No Net Loss” policies that aim to ensure no net loss of existing forested areas. New Jersey’s No Net Loss Compensatory Reforestation Act requires State entities to develop a plan for compensatory reforestation when trees are removed during development of projects involving one-half acres of existing forested land or more and the land is owned or maintained by a State entity. This policy generally does not apply to private forest lands or forested lands owned or maintained by municipal or county governments in New Jersey. In 2024, the State legislature introduced bills to expand this policy to include private lands.²⁷ Beyond the legislature taking action to expand the law, the State agencies could explore ways to expand adoption of similar policies at municipal and county government level through creation of model ordinance language or requiring no-net loss ordinance adoption as a condition or pre-condition for certain state forestry grants.

Enabling Action 2.4 *Implement proactive forest management and other carbon defense practices*

The critical carbon pools²⁸ in New Jersey’s existing forests are at risk from several effects of climate change, including increased risk from wildfire, invasive species, pests, disease, and saltwater inundation (Mylecraine & Zimmerman, 2000;

²⁷ See NJ State Assembly Bill A2093 at <https://www.njleg.gov/bill-search/2024/A2093>.

²⁸ Carbon pools are reservoirs of carbon that have capacity to store and release carbon (Food and Agriculture Organization of the United Nations, 2003).

Crocker, et al., 2013). These risks must be considered alongside forest carbon stores and potential net gains. This action focuses on some of the practices identified in the New Jersey State Forest Action Plan and NWLS that allow forests to maintain their role in the carbon cycle, by defending the existing carbon pool and restoring the function of these ecosystems.

Trees need to photosynthesize to grow and survive. If photosynthesis is impacted in any way, it influences the amount of carbon that will be sequestered. Photosynthesis can be impacted by tree crowding, competition for forest resources, drought, insect and pathogen outbreaks, high winds, or fires. Forestlands with excessive density are at risk of disturbances that can lead to increasing tree loss, with the resulting potential to become net emitters of carbon as dead trees decompose. By implementing management practices that keep our forest resilient and healthy, we are positively influencing photosynthesis, and therefore carbon uptake by forest stands benefiting from that management. Forest stand improvement can include a variety of on-the-ground management techniques such as thinning, shelterwood, invasive plant removal, prescribed burning, planting, etc.

Mortality due to insect outbreaks in New Jersey in the last decade has far exceeded the area impacted by fire, harvesting, or windstorms (Nowak, Meeker, Coyle, Steiner, & Brownie, 2015) (Fettig, et al., 2022) (Clark, Aoki, Ayres, Kabrick, & Gallagher, 2022). As of 2023, there are many invasive insects negatively affecting New Jersey's forests. Some of the most impactful insects include beetles such as the Southern Pine Beetle (SPB) (*Dendroctonus frontalis*) and Emerald Ash Borer (EAB) (*Agilus planipennis*), and leaf defoliators such as LDD Moth (*Lymantria dispar dispar*), which under the right conditions can kill large swaths of trees. The pinelands forests have experienced a steady increase in Relative Density Index over the last century, leaving them more vulnerable to pest species outbreaks, such as the southern pine beetle (Coulson & Klepzig, 2011; NJDEP, 2020). With the invasion of pests, tree mortality and commensurate carbon losses will occur. Actively managing forests that are currently being impacted by or are at high risk of being impacted by invasive and non-native insects can mitigate the risk of large carbon losses over the next few years and decades. Actions that target stand composition and density can reduce the extent, severity, and susceptibility of bark beetle attacks and thereby potential carbon emissions (Moghaddas, 2018).

Wildfires also pose a threat to forests in New Jersey. On average, New Jersey has 1,500 wildfires across 7,000 acres of forested land annually (NJDEP, 2025). To help mitigate catastrophic wildfire events that release large amounts of carbon into the atmosphere, the New Jersey Forest Fire Service conducts prescribed burns in fire-dependent forest and grassland systems. Prescribed burns consume fuels on the forest floor and in the forest understory, known as ladder fuels, without killing or damaging overstory trees. Therefore, if a wildfire were to occur in an area that has experienced prescribed burns, the absence of fuels in that area can cause the wildfire to be less severe, reducing the risk of extensive tree mortality, fire spread, and forest loss. While prescribed burning does release stored carbon into the atmosphere, strategically using prescribed burns in forested areas with high wildfire risks may have a net carbon benefit over time. Actions, such as a combination of tree thinning and prescribed burning, that provide increased crown separation and consumption of surface fuels have been shown to reduce wildfire severity within and adjacent to treated areas. Low and from below thinning is another wildfire and pest mitigation tool that is implemented by the New Jersey Forest Service in conjunction with the New Jersey Forest Fire Service. Low thinning only removes the shortest, suppressed trees within an even-aged forest stand, mimicking the natural mortality of self-thinning that occurs during normal stand development, but at an accelerated rate. This type of thinning removes these "ladder" fuels, mitigating the risk of a wildfire jumping into the forest canopy and reducing the scale of potential future insect outbreaks. In addition to risk mitigation through thinning, several studies have shown that there are carbon gains that can occur as a result of thinning and/or burning treatments on the aboveground carbon uptake in certain forest types (Chiang, 2008; Kashian, Romme, Tinker, M.G., & Ryan, 2006). The New Jersey Forest Service estimates that approximately 178,000 acres of forest in the State would benefit from thinning (NJDEP, 2020).

Deer-overpopulation also poses a significant threat to forest health in New Jersey (Kelly, 2019). Deer over-browse on trees can hinder forest regeneration and eliminate native understory plants, which reduces biodiversity and provides favorable conditions for the spread of invasive plant species. While farmers experiencing deer damage in New Jersey can receive deer depredation permits, State law would need to be revised to enable deer management via depredation

permits on privately managed forest lands. In absence of a legislative change, more State grants for forest management, forest restoration, and planting could cover the costs associated with deer management (i.e. fencing).

The State aims to implement and support improved forest management on 200,000 acres of forest by 2050. As part of this effort the State plans to provide cost share to properties for improved forest management of 100 to 500 acres per year through 2050 (NJDEP & NJDA, 2024).

To fully understand the carbon gain potential (or avoided emissions) from carbon defense strategies through active forest management techniques like thinning and prescribed burning, the New Jersey Forest Service is currently working on a carbon-focused model that uses data collected over the past 5 years from New Jersey forests. This model, called the Forest Carbon and Risk Modeling Assessment (ForCARMA) model will take into account risks like wildfire and insect outbreaks and will be able to compare risk scenarios with management scenarios, business-as-usual scenarios, and “lab conditions” to assess the carbon impacts between different management decisions. NJDEP will also assess forest lands for adequate tree regeneration in response to extensive deer browse or the presence of invasive species and find opportunities to incorporate the Connecting Habitat Across New Jersey (CHANJ) into forest planning and management.

Enabling Action 2.5 Protect existing submerged aquatic vegetation (SAV) from further loss (with no-net loss in SAV)

SAV habitat is declining globally and in New Jersey, contributing to decreases in carbon sequestration by these ecosystems and reductions to essential fish habitat (Lathrop, Styles, Seitzinger, & Bogнар, 2001) (Kennish, et al., 2007). Sea level rise is expected to impact the growth rate, distribution and reproduction of SAV. New Jersey must pursue an integrated approach to protecting and restoring SAV that involves increasing water quality targets at the local and regional levels to offset SAV losses caused by increasing temperatures and water depth (Lefcheck, Wilcox, Murphy, Marion, & Orth, 2017). In order to limit SAV loss to 10% between now and 2030 and then maintain no net loss in SAV through 2050, NJDEP recommends the adoption and implementation of more stringent waste quality and clarity standards as well as new land use regulations that promote more SAV protection work. The State’s existing Coastal Management Rules (N.J.A.C. 7:7-17.10) require restoration for development projects that will impact SAV habitats. The mitigation must be preformed at a 3:1 ratio or higher depending on the size, persistence, and density of the impacted SAV. However, because restoring impacted SAV is more difficult and expensive than restoring other resources, NJDEP routinely works with permit applicants to avoid any disturbances to SAV, and as a result, SAV mitigation is not commonly practiced in New Jersey via this program other than in some instances where disturbance to SAV was unavoidable (NJDEP, 2022). While the existing rules mitigate impacts on SAV from direct development, other factors and activities such as damage from boat propellers, coastal eutrophication leading to harmful algal blooms, storms, floods, disease, and poor water quality threaten SAV’s ability to thrive and sequester carbon. Therefore actions that will address and mitigate these threats could aid in the protection of SAV.

Monitoring will be fundamental to quantifying and determining the trends in density and spatial extent of existing seagrass beds in New Jersey. It will also indicate areas of interest for SAV restoration efforts, as well as furthering our understanding of blue carbon storage capabilities. Near-term actions the State will pursue include: obtaining funding and contractors to conduct an SAV aerial survey with field validation every one to two years; securing funding for monitoring SAV health parameters; and measuring carbon sequestration in New Jersey seagrass beds.

Table 7.5. Measure 2 Implementation Schedule.

Enabling Actions	Timeline	Implementing Agencies
<i>All Natural and Working Land Types</i>		
Continue and expand State-led, high-carbon land acquisitions	Ongoing	NJDEP, Local Governments
Facilitate and incentivize long-term conservation and stewardship of private lands	Ongoing	NJDEP and NJDA

Explore additional, Statewide smart growth land use reforms that limit the development of natural lands and concentrate development in already developed or built-up areas.	Near Term - Ongoing	Legislature, Local Governments, NJDEP; NJDA; SADC; NJDCA;
<i>Forested Lands</i>		
Implement proactive forest management and other carbon defense practices	Ongoing	NJDEP, NJ Forest Service, Local Governments
<i>Aquatic Habitats</i>		
Protect existing submerged aquatic vegetation (SAV) from further loss (with no-net loss in SAV)	Ongoing	NJDEP, Local Governments, NGOs

Table 7.6. Measure 2 Implementation Approach.

Plan to Leverage Funds
Estimated Cost of Measure
High
Secured Funding
New Jersey has a handful of programs that provide funding to support the acquisition and/or restoration and management of natural and working lands, including: • Green Acres Program • Blue Acres Program • Forest Stewardship Program • Natural Climate Solutions Program
Funding Gaps and Opportunities
All enabling actions described for this measure would benefit from additional funds. More funds for conservation and management as well as new funding mechanisms such as carbon markets, compensatory mitigation funds for forest carbon resources, and conservation tax credits, would allow New Jersey to expand and implement these efforts on a wider scale, protecting and defending carbon that is sequestered and stored by the State's carbon sinks. The State has applied to or intends on applying to several federal grants to support its ongoing carbon sequestration efforts under this measure, including, but not limited to the: • NRCS- Conservation Stewardship Program (CSP) • NRCS- Environmental Quality Incentive Program (EQIP) • USFW National Coastal Wetland Conservation Grants • Federal NOAA grants Additionally, the USDA Forest Service's Forest Legacy Program will purchase the development rights of private forested lands or private forested lands themselves.
Geographic Scope
Statewide
Authority to Implement
Subject to further legal review:

NJDEP and NJDA have the authority to support policy and programming and take actions to maintain and increase natural carbon sinks in the State. See, e.g., N.J.S.A. 4:1C-11, 4:10-25.10, 13:1D-9, 13:1L-4. Local governments also have authority to implement supporting projects. New Jersey's Municipal Land Use Law (XXX) and N.J.S.A. 40:55D-13.7 et. seq., 2004 authorize municipalities and counties to establish TDR programs.

NJDEP's authority to acquire land and issue tax exemptions through the Green Acres Program comes from N.J.A.C. 7:36. NJDEP has the authority to regulate diverse ecological resources, which includes wetlands and their transition areas, riparian zones, intertidal and subtidal shallows/tidal waters, submerged aquatic vegetation, and shellfish habitats through the Waterfront Development Act (N.J.S.A. 12:5-3 et seq); the Coastal Area Facilities Review Act (N.J.S.A. 13:19); The Wetlands Act of 1970 (N.J.S.A.13:9A et seq); the Freshwater Wetlands Protection Act (N.J.S.A. 13:9B et seq); the Flood Hazard Area Control Act (N.J.S.A. 58:16A-50 et seq).

Metrics for Tracking Progress

NJDEP will continue to track how many additional acres are acquired for preservation or open space. NJDEP will also maintain its [Green Acres Program State Land Acquisition Dashboard](#) and regularly consult other NJ-managed datasets, like the [NJ Open Space layer](#) that provide an inventory of open space, recreation, and wildlife management areas in the State.

For tracking progress on actions related to preserving and managing the health of natural working lands , NJDEP & NJDA will pursue the actions described in the NWLS.

STAKEHOLDER FEEDBACK



“When it comes to brownfields, municipalities are often penalized for cleaning them up. For instance, needing to continue to pay the cleanup assessment fees after it’s done is burdensome; plus, even getting the initial assessment done to see if a site is contaminated triggers the requirement to remediate which can add cost to municipalities that often don’t have any capacity or funds. So many just do not get assessed. There are structural levers the State and municipalities could put in place to help bring more of these properties back into constructive use.” - Participant in DEP’s South Jersey Climate Action Virtual Community Listening Session held in June 2025



Feedback related to Developed Lands

Community members who participated in the listening sessions and dialogues NJDEP hosted to gather input on this plan generally supported the State’s ongoing efforts to protect and increase sequestration from its natural carbon sinks. Community members representing the State’s more urbanized communities in North and Central parts of the State, emphasized the need for wholistic approaches to “greening” neighborhoods that includes urban shade and street trees, parks, urban farming in tandem with transportation and mobility improvements, whole-of-house retrofits, distributed clean energy and clean heating projects that reduce localized emissions while providing good green jobs. Stakeholder discussions across sessions routinely

focused on concerns about land use and development decisions that promoted sprawl and limited safe mobility alternatives like biking, walking and rolling, rather than more efficient, compact mixed-use development. There was general agreement about the perception that citizens and local environmental commissions do not have a real say in local development decisions that affect emissions and pollution. Increased greenfield development for the construction of warehouses was a major issue highlighted by stakeholders. Stakeholders posed the idea that the State should develop climate-smart land use planning criteria and require that planning boards and zoning boards evaluate land use applications based on those criteria. Additionally, stakeholders requested more State-led education and training about local land use decision-making, local planning and zoning boards, and climate-smart land use principles that would be available to the general public as well as to planning and zoning board members. Participants called for the State to reform brownfield redevelopment policies that currently disincentive infill development and/or place additional burdens on NJ OBCs, such as requirements around cleanup assessment fees and initial assessments.

Feedback related to Forested lands and stewardship



“We overlook and don’t often understand the relationship between Indigenous people’s connection to the land. We tear down opportunities to connect with people and nature all the time. Indigenous people have a connection with the land, where the land is part of the family and home. Black communities have stewarded this land and were historically denied the same access to land. Protecting this land is so important.” - Participant in DEP’s South Jersey Climate Action Virtual Community Listening Session held in June 2025



Participants called for reversal of State policy that prevents Indigenous people (and other New Jerseyans) from foraging on the land. They specifically highlighted support for the proposed bill A5372,²⁹ introduced in the NJ State legislature, which would allow individuals to forage for fruits, fungi, nuts, plants, and parts thereof for their personal use within State parks and forests. Other priority issues heard related to natural and working lands included: the need for more nurseries or expanded State tree nurseries as well as changes to current policies that restrict the sale of native fruit trees from NJ tree farms to non-commercial buyers. Stakeholders also emphasized the positive impact

²⁹ <https://legiscan.com/NJ/text/A5372/2024#:~:text=The%20bill%20also%20provides%20that,of%20sharing%20the%20foraged%20fruits%2C>

that ecotourism has on the State and how strengthening and stewarding our NWLs provides economic benefits as well as environmental benefits

Feedback related to Agricultural lands

One participant voiced frustrations related to State involvement in supporting large farming operations in South Jersey that they believe have caused a lot of the problems they see in their communities that effect human and environmental health (such as those connected to runoff, spraying pesticides and herbicides, saltwater erosion, heavy use of local water resources, diesel trucking and equipment, and spread of disease among animals), while applying restrictions to people's ability to engage in smaller-scale farming or food production. Stakeholders called for removing legal restrictions and regulatory hurdles that prevent people from growing their own food, whether that be in community farms, on their lawns, or smaller-scale farms. Another priority issue that stakeholders identified was the need for increasing access to capital for historically underrepresented groups to purchase land and



*"Native communities feel exploited. There are no ways to collect natural resources. **Land policy conversations often exclude native communities.**"*

- Participant in DEP's South Jersey Climate Action Virtual Community Listening Session held in June 2025



*"Saltwater erosion is an issue in the local aquifer in Salem County because nearby farms are planting foreign tree species that require a lot of local water resources. Many companies want to take the land, come through with diesel trucks that pollute the town and the water. **They're spraying pesticides and herbicides used at nearby farms, neighbors have to close their windows. These are contributing to health concerns in the community.** There are high rates of Parkinson's and other autoimmune diseases and cancer in local communities in Salem County because of the harmful effects from pollution... Our farming is no longer a mosaic farm where you have corn, squash beans and tomatoes... You just have one crop. And its killing the birds, the lightning bugs, and the frogs."* - Participant in DEP's South Jersey Climate Action Virtual Community Listening Session held in June 2025



become farmers and producers.

Feedback related to Wetlands or Aquatic Habitats

Concerns, strategies and initiatives related to blue carbon resources and tidal wetlands were not as prominent in public stakeholder discussions. NJDEP believes this could be due in part to less public understanding and awareness around the potential of blue carbon resources as well as public perception of their relative impact on New Jersey's Overburdened Communities (OBCs). For example, its possible that projects increasing or protecting blue carbon resources tend to be located in non-OBCs and coastal communities which we less represent among participants of the CCAP engagement sessions. One participant voiced concerns about regular flooding that occurs in their South Jersey community and how that also poses an additional issue for low-carbon transportation alternatives, however the participant did not directly connect this concern with NWLs and development that may hinder NWLs and the benefits they offer in terms of increase resilience.

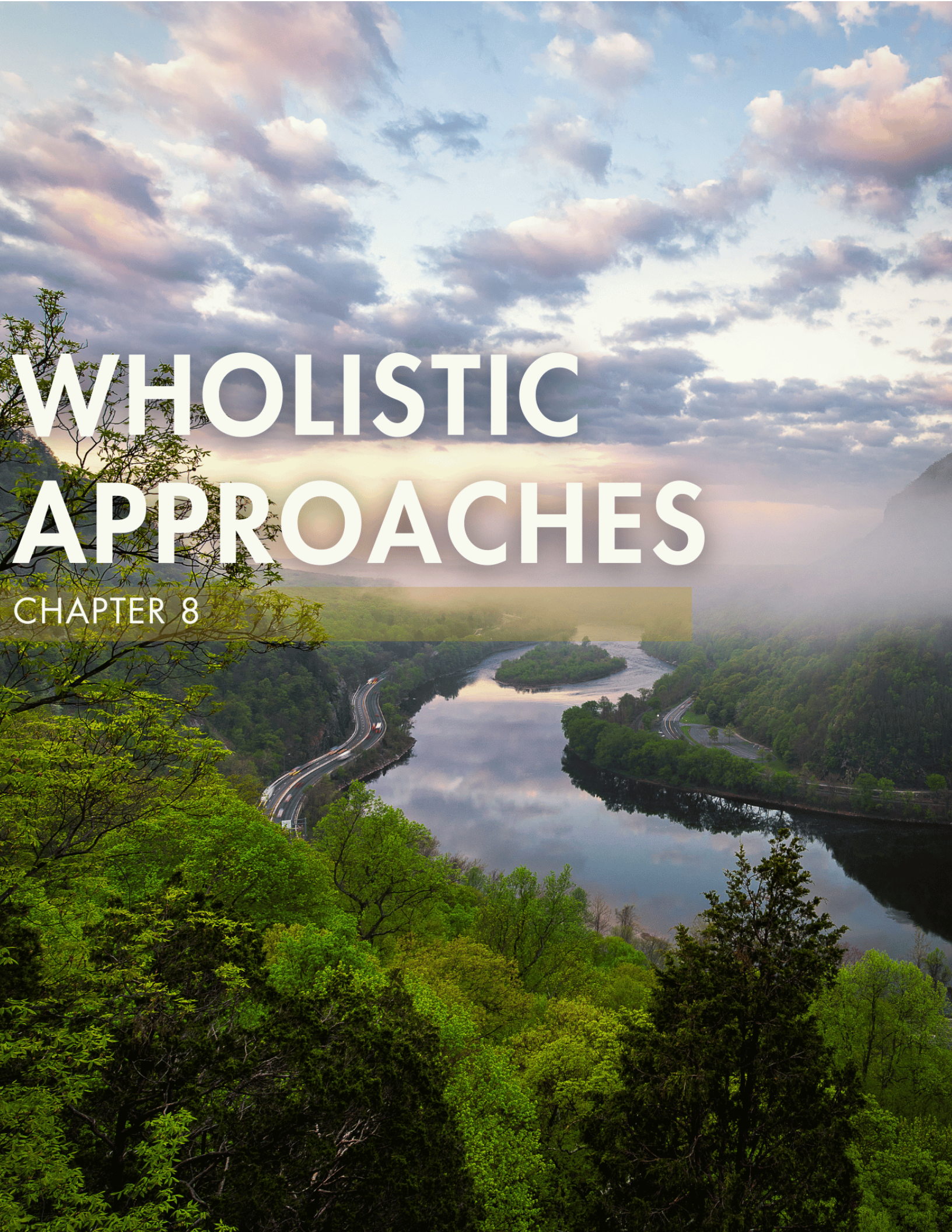
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WHOLISTIC APPROACHES

CHAPTER 8

WHOLISTIC APPROACHES

While the previous chapters of this plan identify greenhouse gas (GHG) reduction measures the State will take to reduce emissions in each sector of its emissions inventory, New Jersey should also explore other strategies over the next 25 years that aim to reduce GHG emissions from sources in multiple sectors or across the entire economy such as:

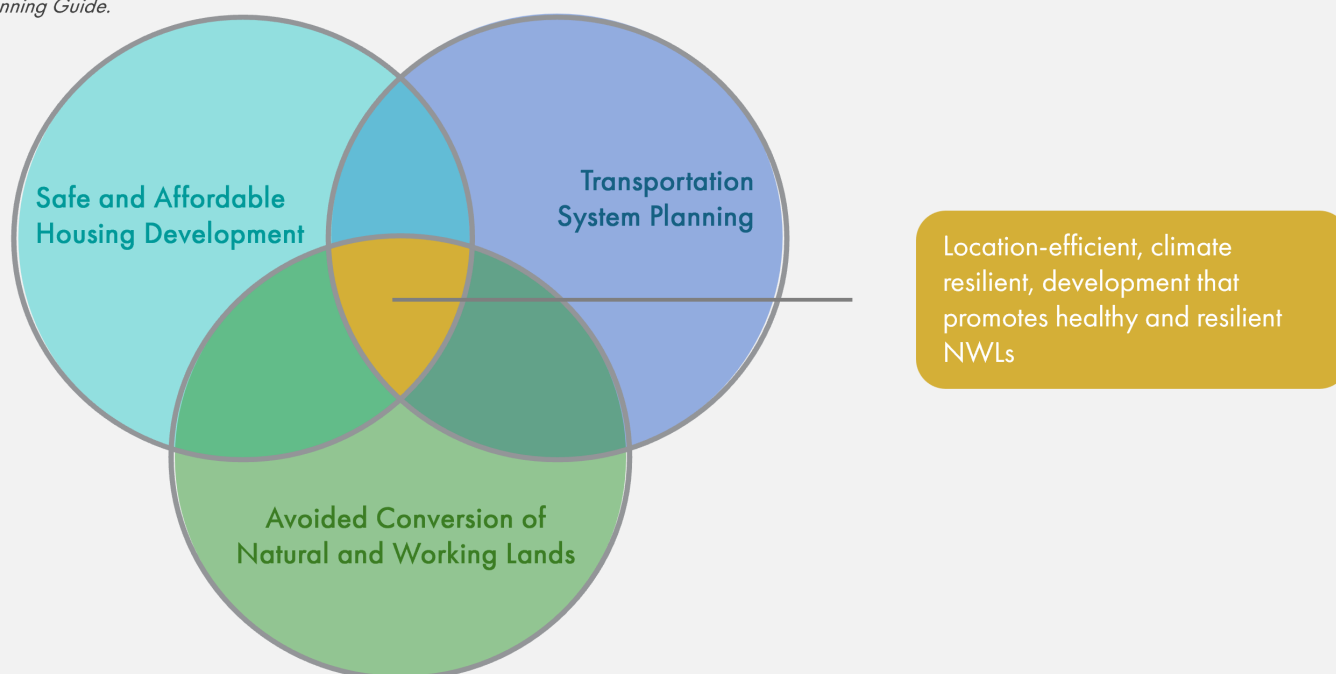
- Statewide land use reforms that integrate climate considerations into housing policy and land use planning;
- Strategies to reduce consumption-based emissions;
- Strategies to reduce black carbon from non-road diesel equipment operating at stationary sources; and
- Economy wide mechanisms for reducing climate emissions.

Consider statewide land use reforms that integrate climate considerations into housing policy and land use planning

Through its initiatives to combat the threat of climate change, New Jersey possesses the capacity to simultaneously address a range of other significant issues confronting the state. New Jersey like many other states, faces a multiplicity of critical social, economic and environmental challenges, several of which are intertwined with climate change mitigation and adaptation: a shortage of affordable housing; a continual loss of natural and working lands; and transportation emissions that account for almost two thirds of its overall GHG emissions with vehicle miles travelled (VMT) projected to rise. It's possible that the State could experience more support for (and success) in achieving its climate goals if it prioritized approaches tackling these problems together rather than separately. Figure 8.1 is NJDEP's graphical interpretation of the conceptual approach described in the US Climate Alliance (USCA) Climate and Land Use Planning Guide (USCA, 2025).

Figure 8.1. Location-Efficient, climate resilient development that promotes healthy natural and working lands.

The US Climate Alliance's Climate and Land Use Planning Guide (2025) outlines an approach for how states, like New Jersey, can reduce their GHG emissions, sequester carbon, and improve climate resilience through a wholistic, coordinated strategy that integrates: (1) the protection of natural working lands; (2) location-efficient planning and siting of renewable energy and transportation system infrastructure that supports compact, efficient development less-reliant on fossil fuels; and (3) deregulation and reforms that expand affordable housing supply and production with a focus on housing that will be out of harms way from disasters. The figure below is NJDEP's graphical interpretation of the approach to location-efficient, climate resilient development described in the USCA Climate and Land Use Planning Guide.



Location-efficient, climate-resilient development policies that promote healthy natural and working lands (NWL) could include:

- **Consider adoption of State-led, zoning and statewide land use reforms**

Reforms could include regulatory and legislative actions to remove barriers to location-efficient housing and infrastructure development. Examples of such reforms that have been implemented in other states include:

- Eliminating various zoning barriers to affordable housing (HUD; NALCAB; & Smart Growth America, 2024)
- Legalizing Accessory Dwelling Units (ADUs)¹
- Transit Oriented Development (TOD) laws and/or minimum density requirements near transit
- Reforming/removing building occupancy regulations
- Reforming/removing minimum parking requirements
- Reforming/removing single stair requirements
- Linking transportation planning with GHG mitigation, such as through a “GHG Transportation Planning Standard” (see Transportation Measure #2)
- Other reforms and policies that encourage increases in infill housing² development through allowing/legalizing multi-family, ‘missing middle,’³ or other higher-density housing (upzoning⁴) by right in certain zones.

- **Encouraging the siting of new homes and infrastructure in ways that minimize land conversions and increase protection against climate threats.**

This may include land resource protection reforms similar to NJ’s Resilient Environments and Landscapes (REAL) rules that ensure new and redevelopment buildings – including affordable housing developments – are safer and improve water quality (NJDEP, 2025). It could also include pursuing additional laws similar to New Jersey’s Dual Use (Agrivoltaics) Law (P.L. 2021, c.170) and Solar-Ready Warehouse law (P.L. 2021, c.290), as well as the development of analysis tools similar to the NJ Solar Siting Analysis and the NJ Solar Incentive Siting Tools. Policies could also involve the State-facilitation of strategies like transfer of development rights (TDR), or certain changes to land value assessment, tax incentives or credits.

- **Providing funding and other incentives for location-efficient housing and infrastructure.**

This may include reducing development costs, providing funding for going beyond latest building energy codes (i.e., adopting a stretch code), and rewarding cities and towns for taking pro-housing and location-efficient development actions listed above.

A 2018 study found that infill housing may be one of the most impactful climate mitigation strategies at the local level (Jones, Wheeler, & Kammen). However, because local governments often face political barriers to implementing desired land use reforms (Subin, et al., 2024); (Schuetz, 2023) and states have the power to enact laws that effect land use

¹ ADUs are smaller homes built on the same property as an existing, stand-alone single-family home. They are also commonly referred to as ‘accessory apartments,’ ‘secondary suites,’ ‘granny flats,’ or ‘in-law suites.’

² Infill housing refers to the development of new residential housing units on vacant or underutilized areas within developed areas rather than expanding out to areas that have not been developed.

³ Missing middle refers to a range of residential building types that offer more than one housing per structure but are still smaller in scale than mid-rise apartment buildings.

⁴ Upzoning refers to the process of changing zoning regulations to allow for a higher density of development (more units or taller buildings) than what was previously allowed. Upzoning and higher density zoning can increase housing supply and lead to greater development density and probabilities (Dong, 2021).

decisions statewide (HLR, 2022), state-led deregulation and land use reforms could enable broader climate and housing production impacts.

Recent research on the ability of state land use reform to reduce VMT-related GHG emissions compared climate pollution emissions in a compact state development scenario⁵ with a business-as-usual development scenario, and found that New Jersey could avoid 1.2 MMT CO₂e in carbon emission pollution by 2033 through implementing state-led land use reforms that prioritize infill housing and location-efficient development (Muralidharan, et al., 2024) (Subin, et al., 2024). These emissions would be avoided from various sources, that span multiple sectors of New Jersey's GHG Inventory (primarily Transportation, Buildings, Natural and Working Lands, and Land Clearing).⁶

The benefits of state land use reforms that promote location-efficient development, rather than sprawl, go beyond emissions. They also present a greater opportunity to build a coalition of support between those advocating for action on climate and housing advocates, developers, NWL conservationists, transportation access and pollution reduction advocates, broadening support for climate mitigation. Increasing the supply of housing is generally understood to effect reductions in housing costs and increased affordability. Land use reforms that promote increased, infill housing not only have the potential to increase affordability, but also improve resident quality of life, through spending less time in cars and less money on car-related costs. Various other benefits may include:

- Higher-density housing is more energy efficient (thereby, it can reduce emissions and energy costs)
- Reduced conversion of natural working lands (more access to green space and recreation opportunities)
- More walkable communities, closer proximity to transit
- Economic benefits to residents (through improved access to services, transit, job opportunities)
- Economic benefits to municipalities through reduced costs for public service connections (emergency services, sewer, etc.)

New Jersey could work with the USCA and others to analyze the potential impact of various combinations of state-led land use reforms on GHG emissions and inform a set of recommendations to the Legislature.

In pursuing these reforms which can improve overall housing affordability, New Jersey should simultaneously address the potential displacement pressures they may induce on low- and moderate-income residents and businesses to prevent the loss of existing affordable housing. Land use reforms and policies that would increase the supply of affordable location-efficient housing and infrastructure development should be paired with affordability and anti-displacement measures to reduce unintended effects that can follow up-zoning, transit-oriented development, and associated investments. These measures may include rent protections or establishment of community land trusts. New Jersey could draw from California Air Resources Board's white paper which summarizes the effectiveness of different anti-displacement strategies that other states can implement (Chapple & Loukaitou-Sideris, 2021). New Jersey can also follow states such as Washington and Oregon and explore providing guidance and development resources for regional and local governments to integrate anti-displacement measures and considerations into their work.⁷

⁵ The study defined compact development case based on NJ's existing driving patterns and assumes that most new housing could be placed in 10 percent neighborhoods across the state that have the lowest VMT today. The analysis methodology states that "This analysis considers transportation emissions associated with new housing a decade from now, using (1) population growth forecasts and housing underproduction data to project new housing constructed, and (2) a census block level data assimilation product of residential vehicle miles traveled (VMT) to determine transportation emissions in each state under different housing development scenarios" (Muralidharan, et al., 2024).

⁶ Roughly 41% of the total emissions avoided by 2033 would be direct emissions avoided from reduced driving, while 23% of the total benefit would be indirect GHG emissions avoided from vehicle manufacturing and upstream fuel production, and the remaining 36% of the emissions avoided would be associated with improved building efficiency, less embodied carbon from fewer construction materials, and avoided conversion of NWLs that would otherwise be lost to sprawl development.

⁷ Oregon Department of Land Conservation and Development's *Anti-Displacement and Gentrification Toolkit* (2020) and Washington State Department of Commerce's *Guidance to Address Racially Disparate Impacts* (2023) are two such examples of state level guidance.

Consider strategies to reduce consumption-based emissions

The scope of New Jersey's GHG Inventory and this CCAP is primarily based on territorial GHG emissions, defined as emissions that are produced from activities and sources within state borders over a timeframe.⁸ However, if one were to consider emissions associated from all that New Jersey produces and consumes both in and outside of its state borders, New Jersey's 'consumption-based' GHG emissions are more than double the level measured in the state level territorial GHG inventory (USEPA, 2024).

A consumption-based inventory tracks emissions from everything used within a state, such as the emissions from a petroleum product made in another state or country, but used in New Jersey; or the emissions from producing the food eaten in New Jersey. This is balanced by subtracting emissions from products produced in New Jersey but consumed elsewhere – like peaches grown in-state but sent to other places.

In 2024, the Northeast Waste Management Officials Association (NEWMOA), in collaboration with US EPA, carried out a Consumption-Based Emissions Inventory (CBEI) for eight northeastern states: New Jersey, New York, Connecticut, Rhode Island, Vermont, Massachusetts, New Hampshire, and Maine. This inventory quantified the emissions associated with all final goods consumed within these states, regardless of where the goods were produced geographically (USEPA, 2024). For each year in the study, the inventory estimated consumption-based emissions were more than double the emissions estimated in the New Jersey state inventory. For example, the most recent non-pandemic year (2019), the CBEI estimated that New Jersey's emissions were 208.6 MMT CO₂e compared to 99.5 MMT CO₂e in the New Jersey State GHG inventory.

Consumption-based emissions policies can include:

- **Consider expanding state laws to include other lower-embodied carbon construction materials such as asphalt and wood, encourage reuse of construction materials and buy clean concrete law**

A range of policies are available that allow states to tackle consumption-based emissions that may occur where goods are produced. For example, New Jersey has two laws encouraging lower-embodied-carbon concrete (LECC) products. Both laws provide incentives for using LECC for New Jersey projects, regardless of where it was produced. The Port Authority of New York and New Jersey adopted Clean Construction standards for concrete and other materials (PANYNJ, 2025). New Jersey could expand state laws to include other lower-embodied carbon construction materials such as asphalt and wood, and to encourage reuse of construction materials.

New York state has adopted a buy clean law for concrete (Post, 2023), which mandates that concrete used in state-funded public projects meet emissions limits. New Jersey could follow suit, benefiting from its geographic proximity to create regional markets and processes. These types of laws typically rely on third-party Environmental Product Declarations (EPDs) that give the history of a product, and an accounting for emissions from creation to the gate.

- **Consider adoption of a range of Extended Producer Responsibility Laws for plastics, film, mattresses, carpets, and paint.**

In addition to construction materials, New Jersey has been considering a range of Extended Producer Responsibility (EPR) Laws for packaging, mattresses, carpets, textiles, and paint. These laws mandate that producers of such products arrange for their responsible end of life management. New Jersey can build upon its fifteen years' long experience implementing its successful electronic waste EPR law. Other states, including California, Colorado, Oregon, Minnesota, and Maine have or are in the process of implementing EPR laws.

⁸ NJ's state GHG inventory also tracks the emissions from imported electricity, and emissions from exported solid waste.

The goal of these programs is to minimize environmental impacts, reduce waste, and to think more broadly about the lifecycle of products. By engaging in lifecycle planning, carbon emissions can be reduced in multiple phases by lowering the amount of waste at a product's end of life and thus lowering the need for raw or recycled inputs and materials for the product. This often includes extending product lifespans and enhancing recyclability.

Lifecycle planning for products reduces emissions at multiple stages and across multiple sectors. It reduces emissions from extraction, manufacturing, transport, and waste. Emissions are reduced in the electric, transportation, industrial, waste, and energy sectors. Additional co-benefits often include reduced pollution and emissions of non-GHG pollutants.

Consider strategies to reduce black carbon from captive non-road diesel equipment operating at stationary sources

Black carbon compromises local air quality and black carbon resulting from diesel combustion is a known carcinogen. Reducing black carbon therefore has benefits beyond those associated with climate protection. New Jersey's overall strategy for reducing black carbon focuses on sources that emit higher black carbon to organic carbon ratios such as diesel exhaust. Thus, reductions in black carbon will come from strategies in the transportation, industrial, and commercial sectors.⁹

Black carbon from non-road diesel equipment makes up almost 30% of the State's black carbon emissions in 2020. Diesel engines employed in non-road equipment, like bulldozers and cranes, have historically not been held to the same emissions standards as similar engines used in on-road vehicles such as trucks. It was not until 2010 that emission standards began to align; however, emission improvements from non-road equipment are slower to realize due to long equipment life and slow fleet turnover. The Mobile Cargo Handling Equipment at Ports and Intermodal Rail Yard regulation focuses on reducing nitrous oxides (NOx) and particulate matter (PM), including black carbon, from diesel cargo handling equipment at ports and intermodal rail yards. The rule phases out older equipment and requires the use of best available control technology while zero-emission technology advances. Not only does this rule continue to reduce emissions which will help the State reach attainment of the ozone National Ambient Air Quality Standard but will provide significant emission reduction benefits to the surrounding overburdened communities.

Strategies to reduce black carbon from non-road diesel equipment operating at stationary sources could include:

- **Consider adoption of rules to mandate conversion of captive non-road diesel equipment**
NJDEP could consider regulatory actions to mandate conversion of captive non-road¹⁰ diesel equipment. Regulating such equipment as stationary sources can reduce the adverse impacts to local air quality and climate.
- **Consider offering an incentive program to support conversion of diesel back-up generators.**
Diesel generators are another non-road stationary source that produces black carbon emissions. In New Jersey's GHG Inventory these emissions are included in the Residential and Commercial sector. The State could offer targeted funding to transition to clean backup generator technology.
- **Consider adoption of clean construction equipment standards, such as fleet emissions averaging, within state funded construction projects (roads, building, etc.).**
Additionally, construction equipment operates in concentrated geographic areas for extended periods of time thus presenting increased exposure to diesel emission by nearby residents. A gradual phase-in to cleaner equipment and exploration of low or zero carbon alternatives is warranted. Therefore another avenue that would

⁹ Black carbon emissions in transportation sector come from on-road transportation, and non-road transportation such as locomotives, marine transport, and aviation. Whereas emissions from non-road construction equipment are included in the industrial sector with the exception of emissions from activities that take place within or around structures such as homes, apartment buildings, stores, and warehouses, including generators to support the activities of the establishments and forklifts at warehouses which are all accounted for in commercial sector.

¹⁰ Captive non-road sources include construction equipment and other on-site vehicles that support operations which are onsite for an extended period of time.

help move the transition to lower emissions from these sources is to establish standards within state funded construction projects (e.g. roads, building) to use clean construction equipment or fleet averaging requirements on construction equipment owners (CARB, 2025). Since 2005, NJDEP's Work Clean Diesel Modernization Program has provided incentives to construction equipment owners who voluntarily choose to transition to cleaner options. Expansion of existing state incentive programs and leveraging of federal transportation dollars allocated to the State can ease the transition to for zero-emission non-road equipment. These incentives should target equipment located in overburdened communities (OBC), ports and airports.

Consider economy wide mechanisms for reducing climate emissions

New Jersey could explore additional state or economy-wide mechanisms to reduce climate emissions in addition to many of the GHG reduction measures and actions described in this plan. This includes pursuing market-based approaches like an economy-wide cap and invest program which provides a clear market-based incentive to reduce pollution and promotes cost-effective reductions.

- **Consider an economy-wide cap and invest program**

New Jersey could adopt an economy-wide cap and invest program like Washington, California, and its neighboring state, New York. These types of programs set a firm, declining limit on GHG emissions from the largest emitters and eligible sources across various sectors of the State's economy and requires them to pay for their climate emissions. These programs help ensure that GHG reduction targets set by states are reached over a long time span, and stimulate billions of dollars investment toward clean energy technology, jobs and place based solutions. The state benefits from the direct reinvestment of program revenues and indirect price signals sent through setting limits and requiring the purchase of carbon emission allowances. California's program has been operational since 2013, and has generated billions in reinvestment in the state's clean energy economy and green jobs. Washington State's program began in 2023 and a 2024 study estimates that in its first 8 years the program could generate more than 45,000 jobs and more than \$9 billion in economic output in clean energy, building efficiency and manufacturing sectors (Jones & DeGolia, 2025). New York State remains intent on finalizing their cap and invest program regulations this year, which is projected to generate between \$61 and \$126 billion over its first 11 years of operation (Courtin, 2025) (Smith, Palta, Shron, & Velez, 2025). If New Jersey were to follow-suit, it could not only ensure it continues on track and actually meets its ambitious climate goals but may also provide direct cost savings in the form of rebates, equipment upgrades, investment in community projects, and lowered costs in the long term (Smith, Palta, Shron, & Velez, 2025). New Jersey already participates in RGGI which is a cap and invest program that covers large grid-connected electricity generating units. In several instances in this plan, NJDEP proposes that New Jersey either continue and expand upon an existing cap and invest program (Electric Generation & Demand Measure #1) or establish a new program to set a declining limit and generate a revenue source (Industry Measure #2 and Highly Warming Climate Pollutants, Natural Gas Transmission and District Measure #1).

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A high-angle, top-down photograph captures a group of children engaged in a community garden project. They are huddled together, focused on digging in the dark brown soil. Several green-handled shovels are visible, some held by the children. One shovel in the foreground holds a clump of soil with roots exposed. The children are wearing various casual clothing, including a dark blue baseball cap, a grey hoodie, and a pink jacket. A rainbow-striped bag is partially visible on the right. The scene is set outdoors on a grassy area, with some green foliage blurred in the foreground. A semi-transparent dark blue rectangular box is overlaid on the left side of the image, containing the text 'COMMUNITY BENEFITS ANALYSIS' in white, bold, sans-serif capital letters.

COMMUNITY BENEFITS ANALYSIS

OVERVIEW OF COMMUNITY BENEFITS ANALYSIS

The community benefits analysis, found in Appendix D, highlights the benefits associated with greenhouse gas (GHG) and co-pollutant emissions measures from implementation of the Comprehensive Climate Action Plan (CCAP) measures. Overall, the implementation of the measures will have a positive impact on human health as well as other co-benefits including increased resilience and enhanced climate adaptation, greater access to climate smart transportation alternatives, improved housing quality (*e.g.*, energy efficiency), enhanced community green space, decreased energy costs and increased energy security, workforce development opportunities, and improved quality of life (*e.g.*, noise reduction). In some cases, implementation of these GHG reduction measures may create disbenefits within New Jersey communities. This community benefits analysis brings these unintentional disbenefits to the fore and includes recommendations regarding how to overcome and/or mitigate these disbenefits.

The search to identify benefits, disbenefits, and considerations to avoid disbenefits when implementing GHG reduction measures focused on the impact the eight different sectors of GHG reduction measures would likely have on various outcomes. These outcomes include public health (including physical and mental health outcomes), access to smart transportation alternatives, housing quality, access to greenspaces, energy costs, workforce development opportunities, and the overall resilience of New Jersey's population to climate change. Of note is that OBC and AIOBC are often disproportionately impacted by environmental stressors (*e.g.*, flood events, temperature extremes, pollution) because these communities tend to live in areas that are more vulnerable to the environmental stressors, and these communities have been subject to historic inequities that hinder their ability to adapt to said stressors.

This community benefits analysis builds on the research and community engagement conducted by Rutgers University for the 2024 Priority Climate Action Plan's (PCAP) Low-Income and Disadvantaged Community (LIDAC) Benefits Analysis (Barr, Lowrie, & Herb, 2024). This included stakeholder feedback collected between September and December 2023 during which stakeholders provided feedback on the 2024 priority measures.

This 2025 community benefits analysis consisted of three primary tasks:

- **Literature Review:** A literature review was conducted to identify likely outcomes and impacts of the GHG reduction measures to the full population of New Jersey, including both primary impacts and coincidental/indirect impacts. The literature review expanded on the literature review conducted for the 2024 PCAP. This literature review yielded over 750 possible sources (including guidance documents and peer reviewed articles) which were narrowed down based on a review of the abstracts of each resource for relevance.
- **COBRA Quantitative Analysis:** USEPA's CO-Benefits Risk Assessment (COBRA) Health Impacts Screening and Mapping Tool was used to quantify the impacts of New Jersey's GHG reduction measures. Analysis was conducted by E3, Inc. and summarized by Rutgers herein. The outputs of the quantitative analysis include: a base-year inventory of co-pollutant emissions statewide; anticipated projected future co-pollutant emissions with and without GHG reduction measures for the years 2035 and 2050 statewide; quantified and monetized health benefits associated with this decrease in co-pollutants for the years 2035 and 2050 by county; and the monetary cost and annual mortality associated with select measures for the years 2035 and 2050 statewide.
- **Stakeholder Engagement:** Stakeholder feedback on the CCAP was collected in April and June 2025 was integrated into this analysis. Stakeholders provided input through several meetings. One in-person community listening session was held co-hosted by the NJ NAACP's Metuchen Edison and Piscataway Branch and the Southern Burlington County NAACP. Three virtual stakeholder engagement sessions were co-hosted by: Tyrese Gould Jacinto Former Vice-Chair of the NJ Environmental Justice Advisory Council; President and CEO of Native American Advancement Corp. and Member of the Nanticoke Lenni-Lenape Nation; Marcus Sibley, Environmental and Climate Justice Chairman for the Southern Burlington County NAACP; Chairman of NJ Progressive Equitable Energy Coalition; and Helaine Barr, Assistant Director of Climate Change, Clean Energy and Sustainability at the New Jersey Department of Environmental Protection (NJDEP).

Figures 9.1, 9.2 and 9.3 provide an overview of the quantitative analysis.

- Figure 9.1 summarizes the annual avoided co-pollutant emissions from the GHG reduction measures in the CCAP for the years 2035 and 2050.
- Figure 9.2 summarizes the statewide co-pollutant emissions in the years 2035 and 2050 under the Business as Usual (BAU), Current Policy (CP), and CCAP Scenarios from the GHG reduction measures in this CCAP.
- Figure 9.3 summarizes the anticipated economic benefits associated with total co-pollutant emissions benefits to the full population of New Jersey. In 2035, the State will save approximately \$777 million by implementing the Current Policies Scenario and will save approximately \$1.2 billion by implementing the GHG reduction measures consistent with CCAP Scenario. These monetary savings increase in 2050 when the State will save approximately \$2.0 billion by implementing the CP Scenario and will save approximately \$3.6 billion by implementing the GHG reduction measures consistent with the CCAP Scenario.

Figure 9.1. Statewide avoided co-pollutant emissions in 2035 and 2050 associated with achieving the CCAP Scenario.

Annual projected avoided co-pollutant emissions of NO_x, SO₂, Ammonia, PM_{2.5}, and VOC compared to the BAU are shown for years 2035 and 2050. Avoided emissions of all co-pollutants combined reach more than 66,000 short tons in 2050.

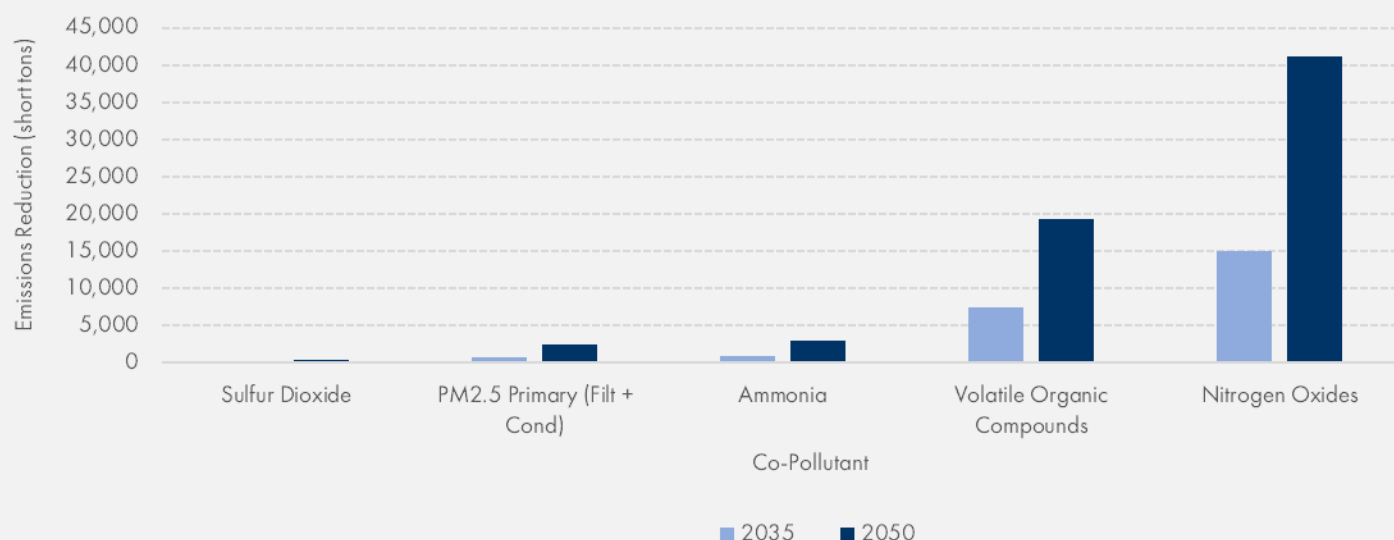


Figure 9.2. Co-pollutant emissions in 2035 and 2050 associated with achieving the CCAP Scenario compared to other scenarios.

Annual projected emissions of NO_x, SO₂, Ammonia, PM_{2.5}, and VOC compared to the BAU are presented in short tons. VOC emissions decrease by over 19,000 short tons and NO_x emissions decrease by over 41,000 short tons with the achievement of the CCAP Scenario.

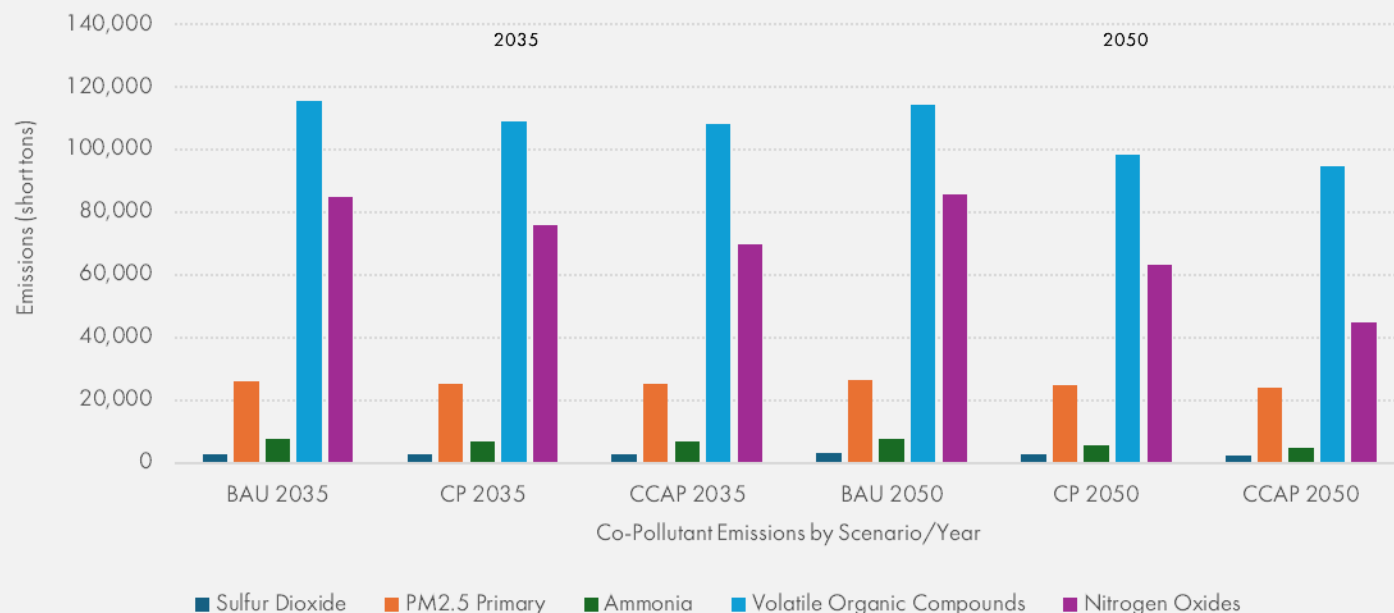
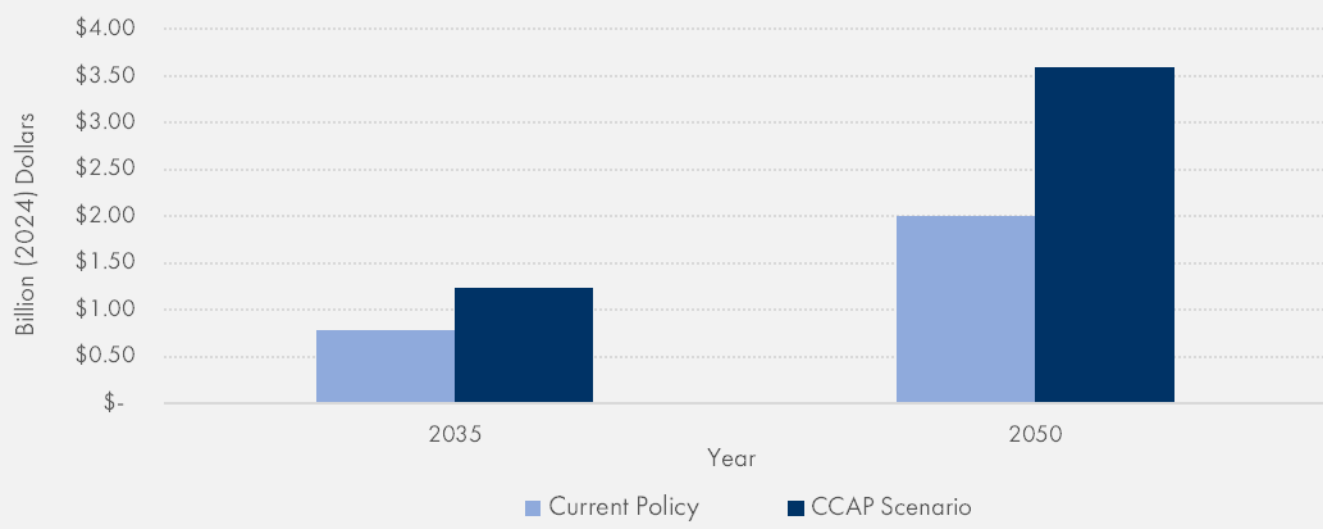


Figure 9.3. Total monetized benefits of all measured health outcomes for all 21 counties in New Jersey annually in 2035 and 2050 for each scenario.
Values in billions of 2024 dollars.



There are three cross-cutting insights from a qualitative analysis of the community benefits:

- Siting more energy-saving and pollution-reducing infrastructure and programs in or near OBC and AIOBC communities would help to mitigate the disproportionate impacts to (and vulnerabilities of) these populations to greenhouse gas pollution and co-pollutants. This includes distributed solar, heat pumps, food waste diversion programs, and restoration and preservation efforts of natural and working lands, to name a few.
- Long-term planning with OBC and AIOBC will be essential to avoiding unintended disbenefits from implementing priority measures. Enabling actions may offer short-term benefits to OBC and AIOBC (e.g., community beautification, energy savings, increased resilience), but renters/homeowners in economically vulnerable communities may be at risk of future displacement due to the increase in value of their home.
- The following are important for ensuring OBC and AIOBC know (1) what CPRG programs they have access to, (2) the benefits of engaging in the enabling actions, and (3) available resources for the enabling actions:
 - Sustained funding
 - Proactive technical assistance
 - Proactive outreach to communities about funding opportunities, technical assistance opportunities, energy-saving and pollution-reducing infrastructure, and long-term planning.

Below is a summary of the GHG reduction measures’ qualitative impact to New Jersey communities (Table 9.1). The table provides an overview of the benefits and disbenefits associated with each measure, and it assigns each GHG reduction measure with a low, medium, and high ranking where “high” indicates a measure with a high positive impact on the full population of New Jersey. A high ranking was generally assigned to measures with (1) broad benefits that are also necessary to build infrastructure that could support other measures and/or (2) implications to a large percentage of the population in New Jersey (*i.e.*, had impacts over a wide geographic area or had impacts to more than one group of people).

Table 9.1. Summary table of the impacts, benefits, and disbenefits associated with the eight sectors and each respective GHG reduction measure.

Table summarizes the impacts, benefits, and disbenefits associated with the eight sectors and each respective GHG reduction measure's rankings and indicates the level of positive impact a priority measure may have on the full population of New Jersey. Each priority measure below is dependent on the implementation of enabling actions to achieve the measure.

GHG Reduction Measure		Summary of Impacts	Impact Ranking for Full Population
Electric Generation and Demand Sector			
1	Codify the 100% Clean Electricity Standard	+ Physical health/improved air quality + Increased resilience + Improved Energy Security + Workforce Development - Physical health/improperly recycling batteries - Household expense of implementing measure.	High
2	Reduce peak demand through adoption of progressive electricity rate designs and flexible loads	+ Physical health/improved air quality - Unequal Distribution of Environmental Benefits - Mental Health issues	High
3	Support the development of 9GW of distributed solar and 19.6 GW of utility scale solar by 2050	+ Physical health/improved air quality + Workforce Development + Mental Health + Improved Energy Security - Physical health/unsustainable manufacturing and transport of materials - Community beautification - Decreased financial security - Non-accessible programing	High
4	Continue to participate in RGGI program.	+ Physical health/improved air quality + Workforce Development + Mental Health + Improved Energy Security - Physical health/unsustainable manufacturing and transport of materials - Community beautification - Decreased financial security - Non-accessible programing	High
5	Continue to support the development of 11GW of offshore wind by 2040	+ Physical health/improved air quality + Workforce Development + Mental Health + Improved Energy Security - Physical health/unsustainable manufacturing and transport of materials - Community beautification - Decreased financial security - Non-accessible programing	High
6	Support the development of 2GW of new nuclear energy generation sources by 2050.	+ Physical health/improved air quality + Workforce Development + Improved Community Financial Security + Improved National Security - Physical health/improperly managed nuclear material and waste - Land Use	High
7	Support the deployment of 22 GW of battery storage by 2050.	+ Physical health/improved air quality + Increased resilience + Improved Energy Security + Workforce Development - Physical health/improperly recycling batteries - Household expense of implementing measure.	High
8	Invest in the development of 7GW of additional clean firm capacity (beyond what is listed above)	+ Physical health/improved air quality and reduced noise pollution + Workforce Development - Physical health/improper transport or use of materials - Economic stress	High
Transportation Sector			
1	Implement a GHG reduction planning standard for state and Metropolitan Planning Organization (MPO) transportation plans to reduce	+ Physical health/improved air quality + Mental Health + Workforce Development - Physical health/pedestrians near streets, poor air quality and accident risk	High

	statewide light-duty vehicle miles travelled (VMT) 3% by 2050.	- Inequity in eMobility access and resources	
2	Implement large-scale public transit projects to reduce statewide light-duty VMT	+ Physical health/improved air quality + Mental Health + Workforce Development - Physical health/pedestrians near streets, poor air quality and accident risk - Inequity in eMobility access and resources	High
3	Explore new pricing and other transportation alternatives that reduce VMT and emissions	+ Physical health/improved air quality + Mental Health + Workforce Development - Physical health/pedestrians near streets, poor air quality and accident risk - Inequity in eMobility access and resources	High
4	Implement all current policies and expand current transportation electrification programs.	+ Physical health/improved air quality + Mental Health + Public Safety + Workforce Development + Increased financial security + housing quality + climate resilience + energy security + noise reduction - Physical health/pedestrian injury - Financial uncertainty	High
Residential and Commercial Buildings Sector			
1	Accelerate heat pump installations	+ Physical health/improved air quality + Financial Security + Workforce Development - Physical health/air pollution - Quality of life (noise pollution, expense)	High
2	Adopt a Clean Heat Standard	+ Physical health/improved air quality + Mental Health + Improved Energy Security - Physical health/air pollution - Quality of life (noise pollution, expense, overpromised benefits)	Medium
3	Upgrade building envelopes	+ Physical health/improved air quality + Mental Health + Improved Energy Security - Physical health/air pollution - Quality of life (noise pollution, expense, overpromised benefits)	High
4	Establish all-electric building codes	+ Physical health/improved air quality + Mental Health + Improved Energy Security - Physical health/air pollution - Quality of life (noise pollution, expense, overpromised benefits)	High
5	Adopt statewide Building Performance Standards	+ Physical health/improved air quality + Mental Health + Financial Security + Increased safety - Human Health - Increased Costs	Medium
6	Adopt Zero Emissions Standards for space and water heating	+ Physical health/improved air quality + Mental Health + Financial Security + Increased safety - Human Health - Increased Costs	Medium
7	Lead by example by decarbonizing State, county and municipal resources	+ Physical health/improved air quality + Mental health + Financial Security + Improved Energy Security + Workforce Development - Physical health/air pollution - Quality of life (noise pollution, expense)	Medium

Industrial Sector			
1	Adopt manufacturing equipment efficiency standards and incentives for energy efficient technologies in manufacturing	+ Physical health/improved air quality + Reduced Energy Costs + Improved Housing Quality + Financial Security + Workforce Development - Environmental Health - Physical Health (exposure to improperly handled materials) - Reliability of Industrial Heat Pumps - Quality of Life (noise pollution, expense)	Medium
2	Implement a mandatory emissions reduction program for high-emitting sources in the industrial sector.	+ Physical health/improved air quality + Improved Environmental Health - Decreased services - Increased noise pollution	High
Waste and Agriculture Sector			
1	Adopt stricter rules for landfill caps and lower threshold for emission reporting and controls at landfills and wastewater treatment facilities (WWTFs).	+ Physical health/improved air quality - Safety Risks - Technology Lock-in	High
2	Expand regulatory requirements for food waste recycling and diversion	+ Physical health/improved air, soil, and water quality + Mental Health - Emissions - Physical Health (exposure to improperly handled materials) - Mental Health - Financial Resilience - Capacity to store food	Medium
3	Apply compost to cropland and pasture	+ Physical health/improved air, soil, and water quality - Physical Health (exposure to improperly handled materials)	Low
Natural Gas Transmission and Distribution Sector			
1	Implement a mandatory emissions reduction program for natural gas T&D systems	+ Physical health/improved air quality + Energy Security - Physical health/worker safety	Medium
2	Stop the expansion of natural gas T&D infrastructure and introduce non-pipeline alternatives	+ Physical health/improved air quality + Financial Security + Workforce Development - Physical health/air pollution - Quality of life (noise pollution, expense, infrastructure disruptions) - Financial Security	High
Halogenated Gases Sector			
1	Implement a refrigerant management program	+ Physical health/improved air quality + Workforce Development - Physical health/worker safety	Medium
2	Implement a refrigerant replacement incentive program	+ Physical health/improved air quality + Workforce Development + Decreased Energy costs - Physical health/exposure to harmful materials	Medium
Natural and Working Lands – Carbon Sequestration			
1	Strengthen and expand existing natural carbon sinks through reforestation, afforestation, and restoration, to at least 10 MMT CO ₂ e/year.	+ Physical health/improved air and water quality + Mental Health + Mental Acuity + Increased resilience + Improved Energy Security + Infrastructure Protection + Workforce Development Opportunities - Installation and management costs - Physical Health (from illegal dumping, ecological changes) - Quality of life (noise pollution, expense, infrastructure disruptions)	High
2	Protect, maintain, and avoid the conversion of natural lands, including 21,000 acres of forested lands,	+ Physical health/improved air and water quality + Mental Health + Mental Acuity	High

	through high-carbon land acquisitions and policies that promote location-efficient development	+ Increased resilience + Improved Energy Security + Infrastructure Protection + Workforce Development Opportunities - Installation and management costs - Physical Health (from illegal dumping, ecological changes) - Quality of life (noise pollution, expense, infrastructure disruptions)	
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WORKS CITED

Barr, J., Lowrie, K., & Herb, J. (2024). *Low-Income and Disadvantaged Community (LIDAC) Benefits Aanalysis for the New Jersey Department of Environmental Protection's Priority Climate Action Plan Process*. Retrieved from <https://www.epa.gov/system/files/documents/2024-03/nj-pcap.pdf>

A close-up photograph of a worker's hand, wearing a bright yellow safety glove and a blue jacket, using a red and black power drill to work on a solar panel. The solar panel is dark blue with a grid of white lines. The background shows more solar panels and a clear sky. The text "WORKFORCE PLANNING ANALYSIS" is overlaid in white, bold, sans-serif font on a semi-transparent blue rectangular background.

WORKFORCE PLANNING ANALYSIS

OVERVIEW OF WORKFORCE PLANNING ANALYSIS

The New Jersey Department of Environmental Protection (NJDEP) contracted Rutgers, The State University of New Jersey, to assist with the development of the Comprehensive Climate Action Plan (CCAP). As part of this effort, the John J. Heldrich Center for Workforce Development was engaged by the Climate Change Resource Center (CCRC) at Rutgers University to conduct a Workforce Planning Analysis for inclusion in the CCAP. The Heldrich Center for Workforce Development leads research and policy focused on workforce development, education, and labor market issues.

In parallel to this work, in September of 2025, the State of New Jersey released its *Growing Green Jobs: The Opportunities for New Jersey’s Workforce* report (2025). This report conducted economic and employment modeling based on two potential pathway scenarios from the state’s 2024 Energy Master Plan (EMP). The Current Policy Scenario from the EMP was chosen as the basis for the occupational analysis for this report as it details a path forward that relies on policies and programs currently in place for New Jersey while the High Electrification Scenario from the EMP was chosen as a complement to the Current Policy Scenario, on the basis that high electrification presents a similar pace of change through 2035 but incorporates greater levels of building electrification and additional in-state, non-fossil electric generating capacity. In comparison, the CCAP Workforce Planning Analysis, presented below, focused on the energy Demand Management Scenario (referred to as “CCAP Scenario” throughout this CCAP) in the EMP and addressed all related carbon emission and sink sectors.

The 2025 Green Jobs report serves as a helpful resource, providing a deeper analysis than the CCAP workforce planning analysis. The sectors and technologies it measured are focused in the electricity, fuels (including waste), buildings, and transportation sectors. It includes occupational profiles, with detailed wage and demographic data as well as education and training requirements, for 12 high-priority occupations that are important to help the state meet its green economy goals. These priority occupations include, for example, carpenters, construction laborers, electricians, heating, ventilation and air conditioning (HVAC) mechanics and installers, plumbers, welders, and solar photovoltaic installers. The report includes findings that, since 2021, the State’s green economy has increased its workforce by 12%, or 6,000 jobs, and that approximately 14,300 to 42,400 net new workers will be needed primarily in the green economy sectors, overwhelmingly in the construction and maintenance value chains, under the Current Policy and High Electrification Scenarios, respectively.

Alternatively, the CCAP Workforce Planning Analysis report provides an analysis of industry and occupational trends for the eight sectors in the CCAP. It identifies workforce development strategies that align with and support action towards realizing New Jersey’s climate priorities. For the Workforce Planning Analysis, the Heldrich Center applied a four-pronged research approach that includes: analyzing the State’s green economy labor market, updating its inventory of education and training programs relevant to NJDEP’s eight sectors, identifying barriers that underserved populations may experience in accessing opportunities in the Green Economy, and identifying sector-specific workforce development opportunities. This work supports a comprehensive understanding of the workforce needs associated with New Jersey’s climate goals, specifically the sectors and measures identified by NJDEP, and it ensures that workforce strategies are aligned with ongoing climate-focused programming and investments underway throughout the State.

Four-Pronged Approach to Analysis

1. Analyzing the New Jersey’s green economy labor market
2. Updating inventory of sector-specific education and training programs
3. Identifying workforce barriers that underserved populations may experience in accessing opportunities
4. Identifying sector-specific workforce development opportunities

The Heldrich Center’s Workforce Planning Analysis focuses on the following sectors:

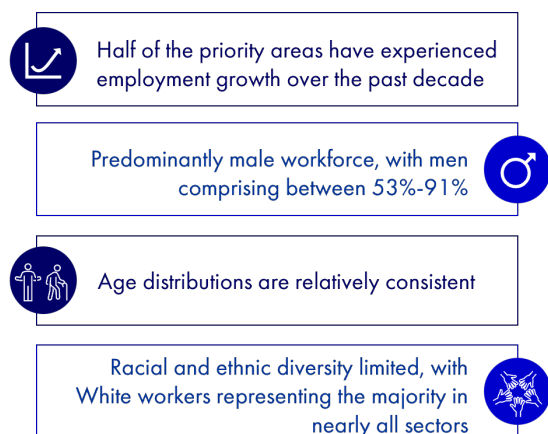
- Electricity Generation and Demand
- Transportation
- Residential & Commercial Buildings
- Industrial
- Waste and Agriculture

- Natural Gas T&D
- Halogenated Gases
- Natural and Working Lands – Carbon Sequestration

Researchers used Lightcast, a labor market analytics platform, to analyze employment trends and demographic characteristics across each sector by industry and occupation from 2014 to 2024, and to review 10-year job projections for selected industries and occupations. It is important to note that while projections data provides useful guidance, it may not fully capture the realities of the labor market nor align with other data sources. Forecast models, such as the one used in this analysis, rely on historical patterns and assumptions, meaning they cannot account for unforeseen economic shifts, technological advances, policy changes, priorities, and investments that could significantly alter workforce needs over a ten-year horizon.

This report adopts the definition of the “green economy” used by the NJ Council on the Green Economy’s *Green Jobs for a Sustainable Future* report (2022), which emphasizes employment tied to environmental infrastructure and energy efficiency. In the context of this workforce planning analysis, the green economy is understood through the lens of the eight sectors identified by NJDEP (see the list above).

Key Workforce Characteristics



Based on the analysis of Green Economy industries, several key workforce characteristics emerge from the data. About half of the sectors have experienced employment growth over the past decade, although this trend is not consistent across all sectors. These industries are predominantly male, with men comprising between 53% and 91% of the workforce. Age distributions are relatively consistent across the sectors. Nonetheless, some industries, such as the Halogenated Gases sector and Natural and Working Lands – Carbon Sequestration sector, have notably older workforces. Racial and ethnic diversity remains limited, with White workers representing the majority in nearly all sectors, followed by Hispanic or Latino¹ and Black or African American workers. Looking ahead to 2034, employment in the Transportation sector, Industrial sector, Natural and Working Lands - Carbon Sequestration sector, and Waste and Agriculture sector is projected to continue growing, albeit some at modest rates. Importantly, the expected declines in the Halogenated Gases sector, Residential & Commercial Buildings sector, and

Natural Gas transmission and distribution (T&D) sector are, in general, relatively minor. The Electricity Generation and Demand sector shows a larger decrease. All findings should be interpreted with caution given the assumptions made when generating the estimations.

Between 2014 and 2024, workforce trends across Green Economy occupations showed notable variation, with half of the eight sectors maintaining a small and stable employment level and the other half—specifically the Electricity Generation and Demand sector, Transportation sector, and Residential & Commercial Buildings sector—experiencing employment growth, while the Waste and Agriculture sector saw a slight decline. These patterns were mirrored in wage differences, with the Natural and Working Lands - Carbon Sequestration sector having the lowest median annual earnings and the Residential & Commercial Buildings sector the highest for the most part of the decade. Despite some apparent mismatches between earnings and employment trends, the data do not provide enough evidence to confirm labor shortages or surpluses. Demographically, most occupations are male-dominated and concentrated among workers aged 25 to 54 years old. Racial and ethnic diversity remains limited across occupations within these priority

¹ The label “Hispanic or Latino” comes from the data source used in this analysis. Lightcast, the data provider, categorizes individuals under a single race or ethnic identifier, including “Hispanic or Latino” as a distinct category. Therefore, other racial categories (e.g., White, Black or African American, Asian) implicitly refer to non-Hispanic or Latino individuals. For consistency in terminology and accurate representation of the source, researchers at the Heldrich Center adopt the same labeling conventions. More information from the source can be found here: <https://docs.lightcast.dev/data-sets/us-occupation-by-race-and-ethnicity>.

sectors, although the Halogenated Gases sector Industrial Processes and Product Use (IPPU) has the highest share of Asian workers (14%). Looking ahead, most of the sectors are projected to grow between 2024 and 2034.

In order to assess the State's workforce capacity for the eight sectors in the CCAP, researchers developed an [inventory](#) of education and training programs. The inventory identified 7,437 education and training programs that offer certificate or degree opportunities in New Jersey for occupations associated with the eight sectors. The majority of education and training programs in New Jersey are concentrated in the Natural Gas T&D sector, which accounts for 27% of all programs. This concentration is followed by the Industrial sector (nearly 23%) and the Residential & Commercial Buildings sector (19%). Researchers also included NJDEP's [Overburdened Community \(OBC\) data](#) in the inventory of education and training programs to further examine access to education and training from the lens of underserved populations in the state. Several trends emerged from researchers' examination of the relationship between the number of programs and the demographic indicators from the OBC data. Counties with a higher number of education and training programs, such as Middlesex, Mercer, Essex, and Bergen, tend to show higher percentages of minority populations (as in Essex), lower percentages of low-income individuals (as seen in Bergen and Middlesex), and generally lower rates of limited English proficiency, with the exception of Passaic and Hudson. In contrast, counties in the southern region of New Jersey, which have the fewest programs, are characterized by higher proportions of low-income residents and the lowest levels of limited English proficiency.

Researchers also examined New Jersey's current Green Economy landscape, reviewing the ongoing programming and investments spearheaded by the Office of the Governor, NJDEP, New Jersey Economic Development Authority (NJEDA), and the New Jersey Department of Labor and Workforce Development (NJDOLE).

Through the research, the Heldrich Center identified seven common barriers that OBC populations may experience in accessing job opportunities, with a particular focus on employment in the Green Economy. These barriers are listed below:

- Limited access to education systems that provide affordable career and vocational-technical education and training opportunities.
- Limited awareness of available career pathways, including the skills, education, and training required to access high-quality, good jobs.
- Limited awareness of public programs, services, and resources that support career development and skills training.
- Limited awareness of public programs, services, and resources that provide wraparound services, addressing childcare and family issues, crime and substance abuse, housing instability, disabilities and mental and physical health, and other needs.
- Inadequate policies, frameworks, and incentives to promote diverse and inclusive hiring practices.
- Limited availability of high-quality, good jobs.
- Limited access to reliable, affordable personal or public transportation.

Addressing these multifaceted barriers will require deliberate and strategic investment, ensuring that future resources, programming, and supports are intentionally allocated with an equity-centered lens as well as informed by a meaningful understanding of the nature of these systemic barriers in OBCs. For this reason, targeted workforce development strategies and investments are needed to systemically address these barriers in OBCs throughout the state of New Jersey to foster long-term, sustainable change.

The Heldrich Center proposes the following workforce development strategies tailored to each of the CCAP sectors, as seen in Table 10.1. NJDEP, as well as other relevant stakeholders in the State, can consider these workforce development strategies as possible avenues by which to foster greater targeted investment and alignment in workforce, education, employer, and sector needs in the Green Economy.

Table 10.1. Workforce Development Strategies for CCAP sectors.**Electricity Generation and Demand sector**

Workforce Development Strategy: *To support New Jersey’s offshore wind, solar, and nuclear energy generation plans, as well as increase utilization of battery storage, there is a need to strengthen career awareness in secondary and post-secondary education institutions for career pathways in this sectors.*

Strategy Summary: NJDEP, working in coordination with relevant stakeholders, could integrate clean energy curricula, specifically solar, nuclear, and offshore wind concepts and battery storage design, utilization, and installation, into secondary and post-secondary institutions, including technical schools, community colleges, and union apprenticeship programs. NJDEP might also consider how to build upon models of engagement and investments already underway in New Jersey, including NJEDA’s [Wind Institute for Innovation and Training](#) and the New Jersey Council of County Colleges’ [NJ Pathways project](#). To further complement the expansion and integration of clean energy curricula in secondary and post-secondary institutions, relevant stakeholders could also regularly examine labor market data for key industry segments of the Electricity Generation and Demand sector.

Transportation sector

Workforce Development Strategy: *Expand and standardize formal education and certification pathways for specialized workforce training programs for electric vehicle charging infrastructure with New Jersey’s Community Colleges and Technical Schools.*

Strategy Summary: New Jersey state agencies are supporting the expansion and incentivizing the purchase of electric vehicles for both personal and commercial usage. Research suggests that the growing EV industry will require a diversity of workers engaged in scientific research to improve the EV technology over time, refine the technologies’ design and development, and progress EV battery manufacturing, as well as a need for workers engaged in EV maintenance and repair, and charging infrastructure development (Shrestha et.al, 2025). In considering this diversity of roles, there is a need to expand and standardize formal education and training pathways for high-quality jobs in the EV sector, which will necessitate that community colleges and technical schools play a central role in preparing students for job opportunities deploying emerging technologies in this industry.

Residential & Commercial Buildings sector

Workforce Development Strategy: *Support and enhance workforce development infrastructure to meet the growing demand for electrifying residential and commercial buildings.*

Strategy Summary: Since research suggests that there are workforce challenges that may hinder workforce growth in this sector, NJDEP, in conjunction with other stakeholders, could consider advancing locally driven career awareness strategies while also strengthening connections between employers and educational institutions to align opportunities to develop new talent and reskill the existing workforce. Strengthening partnerships to foster collaboration between employers and educational institutions, specifically community colleges, technical schools, and the K-12 system, could support building both a more responsive and inclusive workforce development infrastructure for energy efficiency jobs and the Residential & Commercial Building sector overall.

Industrial sector

Workforce Development Strategy: *Promote and expand certification and upskilling opportunities for the existing workforce to attain the skills needed to operate and maintain energy-efficient technologies in manufacturing.*

Strategy Summary: A priority for NJDEP within the Industrial sector is adopting manufacturing equipment efficiency standards and offering incentives for the use of energy-efficient technologies in manufacturing. A corresponding workforce development strategy could focus on upskilling the existing workforce through education and training opportunities that specifically focus on energy-efficient manufacturing. As seen in the [inventory](#) of education and training programs, the Industrial sector accounts for 23.4% of education and training programs, affording ample opportunity for refined and tailored curricula that entice the current workforce to seek upskilling and reskilling opportunities

to ensure that their skills are competitive and match employers' needs in the future. Engagement with the state's vocational and technical schools and county colleges would support the alignment of curricula to reflect the emergence of new technologies.

Waste and Agriculture sector

Workforce Development Strategy: *Create a multipurpose awareness and education campaign designed to both promote regulatory compliance and increase awareness of career opportunities.*

Strategy Summary: The CCAP strategy for this sector includes a focus on an education campaign to foster efforts to both improve compliance and generate career awareness. An awareness and education campaign could aim to build understanding of green job opportunities, skill requirements, and workforce pipelines. Data from the Bureau of Labor Statistics highlights that specific job opportunities within this sector include, but are not limited to, Refuse and Recyclable Material Collectors, Plant and System Operators, Hazardous Materials Removal Workers, and Operating Engineers & Other Equipment Operators. New Jersey offers a notable concentration of formal education and training programs in this sector particularly in Mercer, Middlesex, Essex, and Hudson Counties, while there are very few programs in Cape May, Salem, and Hunterdon Counties. A locally driven awareness and education campaign could help promote targeted community outreach, refine messaging, and highlight accessible career onramps and pathways into the sector.

Natural Gas T&D sector

Workforce Development Strategy: *Develop targeted programming that leverages local community networks to promote career pathways while also instituting mechanisms for the provision of supportive services designed to reduce barriers to education and employment access.*

Strategy Summary: The CCAP strategy for the Natural Gas T&D Sector (Oil & Gas Systems) focuses on an expansion of regulation to monitor natural gas emissions and the introduction of alternatives to traditional infrastructure developments, which highlight the growing need for a trained and skilled workforce able to support advancements in monitoring technologies and infrastructure development and/or construction practices within the sector. The labor market assessment of this sector revealed that a majority of the workforce is male, White, and above the age of 45, which suggests a need to diversify the pipeline of workers entering the sector, with particular regard to creating and promoting opportunities for youth to engage in this sector

as a significant portion of the current workforce approaches retirement. For this reason, NJDEP and other stakeholders could consider advancing locally driven career awareness and engagement strategies in OBCs and diverse communities throughout the state, as well as offering supportive and wraparound services to reduce possible barriers to entry for education and employment in this sector.

Halogenated Gases sector

Workforce Development Strategy: *Work with employers and education providers to transition workforce training programs to support new technologies, such as low-global warming potential (GWP) refrigerant products.*

Strategy Summary: The CCAP strategy for the Halogenated Gases sector (Industrial Processes and Product Use, or IPPU) includes implementing two programs - a refrigerant management program and a refrigerant replacement incentive program. With these new initiatives, there will also be a need for a trained and skilled workforce to support the maintenance and repair of these new technologies. Developing and updating education and training programs to be aligned with emerging technologies, specifically the manufacturing, installation, maintenance, and repair of low-GWP refrigerant and HVAC technologies, could be an area for critical future investment to ensure that the workforce is equipped with the relevant skills and competencies required to meet the evolving industry demands. As education and training materials are updated to incorporate emerging technologies and other advancements, NJDEP and other stakeholders could consider the ways in which to involve employers in this development process, working in collaboration with relevant educational institutions and training providers, and fostering and/or incentivizing the creation of employer networks in the service of engagement with education institutions and training providers.

Natural and Working Lands – Carbon Sequestration sector

Workforce Development Strategy: *Partner with relevant stakeholders to design and launch a federally registered apprenticeship program.*

Strategy Summary: NJDEP, working in coordination with other relevant stakeholders, could consider the development of a federally registered apprenticeship program. A federally registered apprenticeship program offers an accessible on-ramp into employment in the Green Economy, as the apprenticeship model often includes lower barriers to entry, thereby making it particularly accessible for individuals in OBCs. NJDEP, working in partnership with the NJDOL, relevant training providers, and potentially the New Jersey Future Farmers of America (FFA), could collaboratively design and implement a federally registered apprenticeship program. The creation of a federally registered apprenticeship program would also allow for engagement with the state’s public workforce development system, specifically through the Workforce Innovation and Opportunity Act.

APPENDIX A

FULL LIST OF MEASURES AND ENABLING ACTIONS



Definition Key

Measure:

Broad term for a program, policy, project or initiative or bundle of initiatives the state could pursue to reduce GHG emissions. In the report, each measure is quantified and requires an implementation schedule, cost and authority evaluation.

Enabling Actions:

Critical steps, identified as part of the implementation schedule, which are necessary to implement the measure.

Transportation Sector
Measure 1: Continue to implement all current policies and expand current transportation electrification programs
Enabling Action
1.1 Implement Advanced Clean Trucks Rule
1.2 Implement Advanced Clean Cars I + II Rules (rules take effect in 2027)
1.3 Implement policies to increase the light-duty EV sales share
1.4 Increase availability of light-duty electric vehicle charging infrastructure
1.5 Implement policies to increase the medium- and heavy-duty zero-emission vehicle sales share
1.6 Implement policies to decarbonize transit vehicles
1.7 Increase availability of medium- and heavy-duty electric vehicle charging infrastructure
1.8 Implement policies to increase the non-road ZEV sales share
1.9 Support workforce development efforts related to zero-emission vehicles
Measure 2: Implement a GHG reduction planning standard for State and Metropolitan Planning Organization's transportation plans
Enabling Action
2.1 Revise project scoring criteria to include GHG and/or VMT impacts
2.2 Pass legislation to require coordination between transportation planning and GHG reduction
2.3 Set a statewide light-duty VMT reduction target
2.4 Create a commission or technical advisory committee to assess the GHG impacts and, support implementation of a planning standard
Measure 3: Implement large-scale public transit projects and policies to increase transit ridership
Enabling Action
3.1 Continue to support the planning construction and completion of the full Gateway Program and supporting Gateway Projects
3.2 Continue to plan, construct and make operational the Glassboro-Camden Light Rail (LRT) and South Jersey Bus Rapid Transit (BRT) Projects
3.3 Plan, construct and make operational the Hudson-Bergen Light Rail "Northern Branch Corridor" Extension Project
3.4 Plan, construct and make operational the Secaucus to Meadowlands (Boonton) Transitway
3.5 Plan, construct and make operational the Lackawanna Cutoff Project
3.6 Explore the adoption of various policies to increase transit ridership
Measure 4: Explore new pricing mechanisms, and other transportation alternatives that reduce VMT and emissions
Enabling Action
4.1 Continue to explore alternatives for the State gas tax, such as a VMT fee

- 4.2 Explore other pricing mechanisms such as congestion-pricing and parking cash out incentives
- 4.3 Provide support and incentives for telework and other strategies that reduce transportation demand

Residential & Commercial Buildings Sector

Measure 1: Accelerate heat pump installations

Enabling Action

- 1.1 Implement and expand upon the BPU's Triennial programs
- 1.2 Develop an energy advisor, navigator, or guide for energy customers seeking electrification and energy efficiency improvements
- 1.3 Develop education and outreach materials and training and apprenticeship programs on heat pumps for residential and commercial stakeholders
- 1.4 Work with utilities to launch building decarbonization start up programs and additional demonstration "pilot" projects surrounding thermal energy networks
- 1.5 Develop a renewable heating and cooling web calculator tool for New Jersey
- 1.6 Develop a ground source heat pump tool for New Jersey stakeholders and update the ground source heat pump baseline report
- 1.7 Establish phased pathways for large-scale thermal energy networks, beginning with utility-led pilots and supporting future community-scale deployment
- 1.8 Explore continuation of NJBPU's Higher Education Decarbonization Pilot Program
- 1.9 Phase out programs that incentivize fossil fuel equipment replacements
- 1.10 Require tenant protections for building owner participation in incentive programs
- 1.11 Consider rate reform to encourage electrification and demand flexibility while improving equity
- 1.12 Establish long-term statewide heat pump targets
- 1.13 Implement the Governor's Office Strategic Roadmap for Building Decarbonization and NESCAUM's Multi-State Action Plan
- 1.14 Require heat pump courses in the core curriculum for HVAC contractors pursuing licenses
- 1.15 Catalyze green lending capacity to electrify buildings via New Jersey's Green Bank
- 1.16 Enhance financial incentives for large-scale ground source heat pumps
- 1.17 Form a multistate partnership like the New England Heat Pump Accelerator to advance heat pump adoptions in the Mid-Atlantic region

Measure 2: Adopt a Clean Heat Standard

Enabling Action

- 2.1 Establish a heating fuel reporting rule
- 2.2 Evaluate and adopt a Clean Heat Standard
- 2.3 Develop tools to assist with building electrification plans
- 2.4 Expand research and development initiatives for energy efficiency and clean heat technologies
- 2.5 Implement the relevant enabling actions from Measure 1 regarding financing mechanisms to spur furthered heat pump adoptions

Measure 3: Upgrade building envelopes

Enabling Action

- 3.1 Provide resources to building owners, operators, and occupants to help audit their building's energy usage
- 3.2 Focus on opportunities to increase efficiency in the least efficient buildings, with a focus on low- to moderate-income households
- 3.3 Embed building envelope upgrades in utility programs aimed at electrification and other clean energy technologies
- 3.4 Explore a disclosure or reporting requirement of building energy labeling and energy efficiency at point of sale

3.5 Offer targeted programs to enable building envelope and energy efficiency upgrades in low- and moderate-income residential buildings

3.6 Continue implementing the NJ Cool Program and RETROFIT NJ Pilot Program

Measure 4: Establish all-electric building codes

Enabling Action

4.1 Adopt the 2024 International Energy Conservation Code for residential buildings and ASHRAE 90.1-2022 for commercial buildings

4.2 Consider adopting an all-electric building code to maximize energy efficiency in new construction

4.3 Explore requiring all public housing and state funded buildings to construct buildings to all-electric standards

4.4 Revise the rehabilitation subcode to require major retrofit projects to comply with an all-electric building code

4.5 Create guidelines and resources for relevant stakeholders complying with an all-electric building code

4.6 Adopt the latest National Electrical Codes

4.7 Expand incentives for all-electric appliances and equipment

4.8 Mandate energy code courses in the curriculum for licensing programs

Measure 5: Adopt statewide Building Performance Standards

Enabling Action

5.1 Continue with energy benchmarking efforts and conduct data analysis and research

5.2 Evaluate optimal policy designs for a Statewide Building Performance Standard

5.3 Adopt a Statewide Building Performance Standard

5.4 Develop educational and technical resources to enhance benchmarking and building performance standard compliance

Measure 6: Adopt Zero Emissions Standards for space and water heating

Enabling Action

6.1 Evaluate and adapt NESCAUM's Zero Emission Heating Equipment Standard Model Rule to New Jersey

6.2 Provide financial incentives and tax credits for manufacturers producing zero-carbon emission space and water heaters within the State

6.3 Develop technical resources and guidelines for equipment manufacturers, distributors and retailers

6.4 Adopt a Clean Heating Procurement requirement for State buildings

Measure 7: Lead by example by decarbonizing State, county and municipal resources

Enabling Action

7.1 Provide resources to state and local governments to help audit their building's energy usage and achieve energy efficiency and electrification measures

7.2 Leverage an interagency taskforce to lead the entirety of the state's building sector transition

7.3 Continued Implementation of the State Energy Management Circular that requires State agencies to undergo strategic energy planning

7.4 Adapt similar GHG reduction targets to the US DOE Better Climate Challenge

7.5 Pilot building decarbonization efforts at State and local government facilities

7.6 Expedite implementation of energy conservation measures in State government buildings

Electricity Generation and Demand Sector

Measure 1: Revise RGGI rule to conform with 2025 Program Review Model Rule

Enabling Action

1.1 Revise New Jersey's Carbon Dioxide Budget Trading System Rule

Measure 2: Implement a 100% Clean Electricity Standard

Enabling Action

2.1 Enact and Implement Clean Energy Standard Legislation

Measure 3: Reduce peak demand through adoption of electricity rate designs and policies to support load flexibility**Enabling Action**

- 3.1 Expand and accelerate adoption of time of use and time variable rate policies.
- 3.2 Develop and implement strategies to support electric vehicle bi-directional charging and off-peak charge management
- 3.3 Support development and implementation of space heating and cooling energy management opportunities
- 3.4 Develop and implement Virtual Power Plant policies

Measure 4: Support continued availability of existing resources necessary for the energy transition**Enabling Action**

- 4.1 Support nuclear power plant relicensing.
- 4.2 Support transition of combined-cycle natural gas resources to new operational role on the grid.

Measure 5: Support development of an additional 6.2 GW solar photovoltaic capacity**Enabling Action**

- 5.1 Expand Solar PV under the Successor Solar Incentive (SuSI) Program
- 5.2 Expand Solar PV under the Community Solar Energy Program
- 5.3 Site solar infrastructure at State and local government facilities
- 5.4 Develop programs and policies for the years 2040 to 2050.

Measure 6: Continue to support the development of 11 GW of offshore wind by 2040**Enabling Action**

- 6.1 Public Understanding and Engagement
- 6.2 Develop and implement transmission capacity for offshore wind
- 6.3 Support development of offshore wind capabilities at New Jersey port facilities
- 6.4 Support construction of 11 GW offshore wind

Measure 7: Support the development of 2GW of new nuclear energy generation sources by 2050**Enabling Action**

- 7.1 Engage in public outreach
- 7.2 Develop skilled-trades workforce and nuclear energy education opportunities
- 7.3 Support design process and identification of suitable sites
- 7.4 Support development of generation capacity

Measure 8: Support deployment of an additional 13.5 GW of energy storage capacity and comprehensive grid improvements**Enabling Action**

- 8.1 Improve hosting capacity of New Jersey electric distribution system through grid modernization
- 8.2 Support implementation of FERC 2222 for distributed energy resources
- 8.3 Evaluate and, where appropriate, deploy grid supportive technologies such as Vehicle-to-Everything "V2X" and microgrid systems
- 8.4 Implement and enhance storage component of Competitive Solar Incentive program
- 8.5 Support Resilient Local Governments

Measure 9: Invest in the development of 7GW innovative energy technology**Enabling Action**

- 9.1 Support energy and climate education
- 9.2 Support development of new energy-related businesses related to climate mitigation and resilience
- 9.3 Apply promising new technologies to bring 7 GW of clean, firm, dispatchable power online by 2050.

Industry Sector

Measure 1: Adopt manufacturing equipment efficiency standards and incentives for energy efficient technologies**Enabling Action**

- 1.1 Continue participation in multi-state organizations
- 1.2 Evaluate expanding appliance standards and/or benchmarking requirements to industrial entities
- 1.3 Pilot innovation energy efficiency and decarbonization technologies
- 1.4 Continue meaningful industrial stakeholder coordination
- 1.5 Evaluate reforms to electric cost structures for industrial customers to incentivize electrification

Measure 2: Implement a mandatory emissions reduction program for high-emitting sources in the industrial sector**Enabling Action**

- 2.1 Convene stakeholders to inform program design
- 2.2 Evaluate existing emissions reporting requirements and adopt a rule to establish a declining cap on emissions
- 2.3 Offer complementary clean manufacturing technical assistance and expand existing incentive programs for qualifying industrial facilities

Waste and Agriculture Sector**Measure 1: Adopt stricter rules and incentives for monitoring emissions, landfill caps, and odor controls at landfills and wastewater treatment facilities****Enabling Action**

- 1.1 Modify Landfill monitoring and reporting regulations to include lower reporting thresholds for methane emitting facilities and adopt modern monitoring technologies
- 1.2 Evaluate adopting new control requirements on methane emissions
- 1.3 Encourage waste facilities to reduce landfilling of residuals

Measure 2: Expand regulatory requirements and incentives for food waste recycling and diversion**Enabling Action**

- 2.1 Amend the Food Waste Recycling and Food Waste-to-Energy Production Law
- 2.2 Require district solid waste management plans to prioritize food waste reduction and source separation of organic material
- 2.3 Support food waste recovery systems such as anaerobic digesters and co-digestion of food waste at wastewater treatment facilities
- 2.4 Implement regular statewide waste composition audits to track progress towards the goals of the Food Waste Reduction Act
- 2.5 Continue to pursue revisions to the Recycling Rules (N.J.A.C. 7:26A)
- 2.6 Expand State support for initiatives that encourage food waste prevention, recovery and distribute edible food before it is wasted

Measure 3: Encourage precision agriculture and utilization of compost on cropland and pasture**Enabling Action**

- 3.1 Revise recycling rules to streamline community composting and consider tiered permitting
- 3.2 Implement local and regional composting programs, expand availability of composting Education Classes
- 3.3 Encourage and incentivize precision agriculture; create guidelines for efficient fertilizer application

Highly Warming Climate Pollutants**Methane from Natural Gas Transmission & Distribution (T&D) Sector****Measure 1: Implement a mandatory emissions reduction program for natural gas T&D systems****Enabling Action**

- 1.1 Convene stakeholders to inform the design of a mandatory natural gas T&D emissions reductions program
- 1.2 Evaluate existing emissions reporting requirements and adopt a rule to establish a declining cap on emissions

1.3 Incorporate advanced leak detection technology into natural gas operations

1.4 Require natural gas companies to improve on the response times for addressing leaks and reduce emissions from blowdown events

Measure 2: Stop the expansion of natural gas T&D infrastructure and introduce non-pipeline alternatives

Enabling Action

2.1 Coordinate integrated natural gas T&D infrastructure planning across multiple sectors

2.2 Avoid further investments in natural gas T&D infrastructure

2.3 Consider low-carbon fuels as an alternative to natural gas

2.4 Conduct feasibility studies of non-pipeline solutions

2.5 Implement incentives to convert portions of the natural gas systems to thermal energy networks

2.6 Evaluate the role of legislation to encourage zonal electrification

2.7 Develop gas system planning tools, like system pruning or zonal electrification tools

Halogenated Gases Sector

Measure 1: Implement a refrigerant management program

Enabling Action

1.1 Convene stakeholders to inform Refrigerant Management Program

1.2 Design and implement Refrigerant Management Program, including regulations

1.3 Offer complimentary technical assistance

Measure 2: Implement a refrigerant replacement incentive program

Enabling Action

2.1 Convene stakeholders to inform incentive program design

2.2 Design and implement a low-GWP refrigerant incentive program

Natural & Working Lands – Carbon Sequestration Sector

Measure 1: Strengthen and expand existing natural carbon sinks through reforestation, afforestation, and restoration

Enabling Action

1.1 Afforestation of at least 4,000 acres

1.2 Reforest at least 2,000 acres of degraded forests

1.3 Plant 1,000,000 street or shade trees

1.4 Redevelop at least 1,000 acres (200 sites) of brownfield sites into new green space

1.5 Plant cover crops with harvested and cropland pasture lands on 40,300 acres

1.6 Increase cover of salt marsh vegetation by at least 3,000 acres

1.7 Install at least 202,000 feet of living shorelines

1.8 Restore 20,000 acres of Atlantic White Cedar Swamps

1.9 Complete 45 tidal reconnection projects to increase salinity from fresh to salt

1.10 Restore and replant 25 acres/yr of SAV in 2050

Measure 2: Protect, maintain, and avoid the conversion of natural lands, including 21,000 acres of forested lands, through high-carbon land acquisitions and policies that promote location-efficient development

Enabling Action

2.1 Continue and expand State-led, high-carbon land acquisitions

2.2 Facilitate and incentivize long-term conservation and stewardship of private lands

2.3 Explore additional, statewide smart growth land use reforms that limit the development of natural lands and concentrate development in already developed or built-up areas.

2.4 Implement proactive forest management and other carbon defense practices

2.5 Protect existing submerged aquatic vegetation (SAV) from further loss (with no-net loss in SAV)

Wholistic Cross Sector Approaches

Note these are not presented as GHG reduction measures in the plan but are additional strategies or policies the state may want to consider over the next 25 years.

- **Statewide land use reforms that integrate climate considerations into housing policy and land use planning;**
 - Consider adoption of State-led, zoning and statewide land use reforms
 - Encouraging the siting of new homes and infrastructure in ways that minimize land conversions and increase protection against climate threats.
 - Providing funding and other incentives for location-efficient housing and infrastructure.
- **Strategies to reduce consumption-based emissions;**
 - Consider expanding state laws to include other lower-embodied carbon construction materials such as asphalt and wood, encourage reuse of construction materials and a buy clean concrete law
 - Consider adoption of a range of Extended Producer Responsibility Laws for plastics, film, mattresses, carpets, and paint.
- **Strategies to reduce black carbon from non-road diesel equipment; and**
 - Consider adoption of rules to mandate conversion of captive non-road diesel equipment
 - Consider offering an incentive program to support conversion of diesel back-up generators.
 - Consider adoption of clean construction equipment standards, such as fleet emissions averaging, within state funded construction projects (roads, building, etc.).
- **Economy-wide mechanisms for reducing climate emissions.**
 - Consider an economy-wide cap and invest program

A person in a red shirt is running away from the camera on a paved path in a park. In the background, a city skyline is visible, including the Empire State Building. The scene is captured in a wide-angle shot with a soft focus on the background. The text 'APPENDIX B' is overlaid in large white letters on the left side of the image.

APPENDIX B

COMMUNITY ENGAGEMENT AND EJ PRIORITIES

Community Engagement

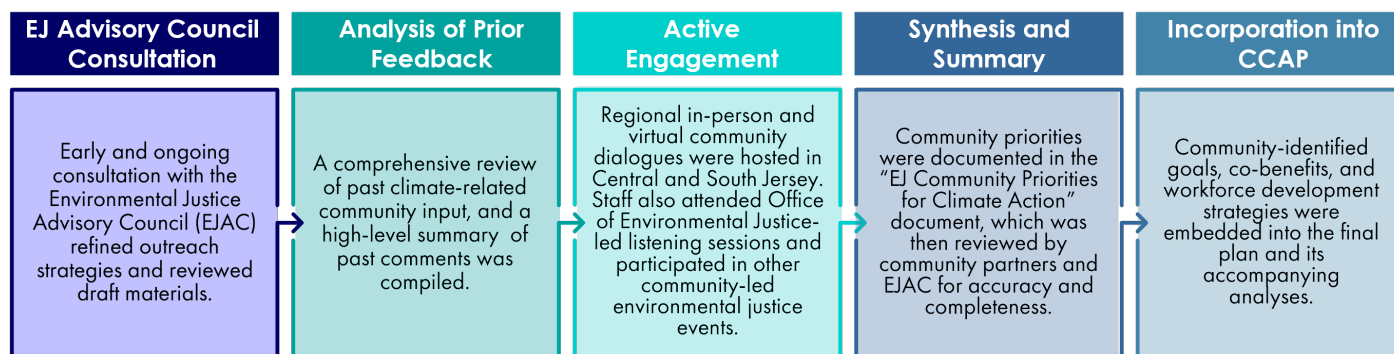
In preparing the CCAP, states were required to design strategies that not only reduce greenhouse gas emissions but also deliver broad community benefits. As part of this effort, grant recipients are required to assess how their proposed climate actions will improve air quality, public health, economic opportunity, environmental quality, and climate resilience. These co-benefits are considered essential to building an equitable and effective climate response.

To meet these goals, NJDEP prioritized inclusive, community-driven engagement. Building on the stakeholder outreach conducted during the PCAP phase, NJDEP centered public voices—especially those from Overburdened Communities (OBCs)—through a robust and values-based approach. The result is a climate plan that reflects community priorities, delivers measurable benefits, and uplifts those most affected by climate pollution and climate risks.

Engagement Framework and Principles

NJDEP's engagement was guided by a values-based framework outlined in a community engagement plan (NJDEP, 2024), which emphasized accessibility, accountability, and respect. These principles—drawn from the U.S. EPA's community engagement guidance (USEPA, 2024)—shaped how the Department engaged with residents and stakeholders across the State. Engagement efforts were accessible, with plain language materials, and logistical support for local event hosting. They were informative, offering participants the background knowledge necessary to engage meaningfully in climate discussions. NJDEP developed a series of educational handouts about climate change, emissions sources, previous community input, and key terminology. The process was interactive, with space for open dialogue and NJDEP in a listening role. Engagement remained continuous, building on previous conversations and maintaining consistent outreach throughout the planning process. Most importantly, it was accountable—community feedback was directly integrated into relevant sections of the plan, including where possible into the GHG reduction measures and enabling actions themselves.

The CCAP public engagement process unfolded in five phases:



Phase 1: EJ Advisory Council Consultation

NJDEP presented the EJAC with the draft community engagement plan and incorporated edits and feedback prior to their approval of the plan and the start of the engagement process. Staff checked in with the EJAC and NJDEP's Office of Environmental Justice (OEJ) at key milestones in the process. NJDEP met with community leaders that were recommended by the EJAC and OEJ and co-hosted several of the community engagement sessions with current or former EJAC members.

Phase 2: Analysis of Prior Feedback

This focused effort recognizes and builds upon the consistent feedback, commitment, and advocacy that EJ communities in New Jersey have provided over many years, ensuring their long-standing priorities are reflected in the Comprehensive Climate Action Plan (CCAP). As part of the development of the plan, staff conducted a detailed analysis of previously collected input from New Jersey's environmental justice (EJ) communities, specifically related to climate change, climate pollution, climate justice, clean energy, and workforce development. This analysis drew on a range of sources to ensure the CCAP reflected the voices and priorities of impacted communities.

To inform this work, staff reviewed and analyzed the following resources:

- Recordings and meeting notes from all OEJ Community Listening Sessions held between November 2021 and the present, which provided insight into recurring concerns and priorities across EJ communities;
- EJ-related public comments received through earlier climate mitigation stakeholder processes, especially those submitted during the Regional Greenhouse Gas Initiative (RGGI) Strategic Funding Plan public stakeholder meetings held in 2022 & 2023, which highlighted community perspectives on state-level climate investments and emissions reductions;
- Comments gathered during the December 2023 EJ Community Dialogue in Newark, hosted by NJDEP's Air, Energy, and Materials Sustainability (AEMS) program, which offered in-depth perspectives on local climate justice concerns;
- Findings from the 2024 Rutgers University report, "Stakeholder Engagement Informing the NJDEP's Priority Climate Action Plan," particularly the section on EJ cross-cutting issues, which synthesized input from multiple stakeholder groups and contextualized them within broader climate planning efforts;
- Feedback from public hearings held in May-June 2024 held by the Board of Public Utilities (NJBPU) and its contractors, E3 and ILLUME, as part of the 2024 Energy Master Plan process, including invite-only stakeholder sessions targeted toward the state's OBC communities, which provided valuable commentary on energy equity and access;
- Preliminary findings from E3's draft workforce analysis for the 2024 EMP, including qualitative data from interviews with community organizations, labor unions, and educational institutions, which helped clarify workforce development needs and gaps across EJ communities;
- Reports, whitepapers, and studies developed by or in partnership with New Jersey-based EJ advocacy organizations, such as the New Jersey Environmental Justice Alliance (NJEJA), which offered grounded, community-authored insights into climate justice priorities.

Staff used these materials to identify common themes, areas of concern, and community-specific priorities. This analysis directly informed the framing of discussion topics for community engagement sessions and helped ensure that the CCAP is rooted in community experience and equity-focused outcomes.

Phase 3: Active Engagement

NJDEP held a series of community engagement sessions across the State to build upon the previously identified priorities and gather place-based feedback for the CCAP. These sessions, held in North, Central, and South Jersey, centered public voices, particularly from OBCs and low-income communities, to ensure the plan speaks to those community priorities. NJDEP staff also attended relevant community meetings, not held specifically for the CCAP over this engagement period. This included the Camden Climate & Health Justice Listening Circle, hosted by the Bread & Roses Community Fund (April 2025), and community engagement sessions hosted by NJDEP's OEJ in Trenton (June 2024) and Cape May (September 2024).

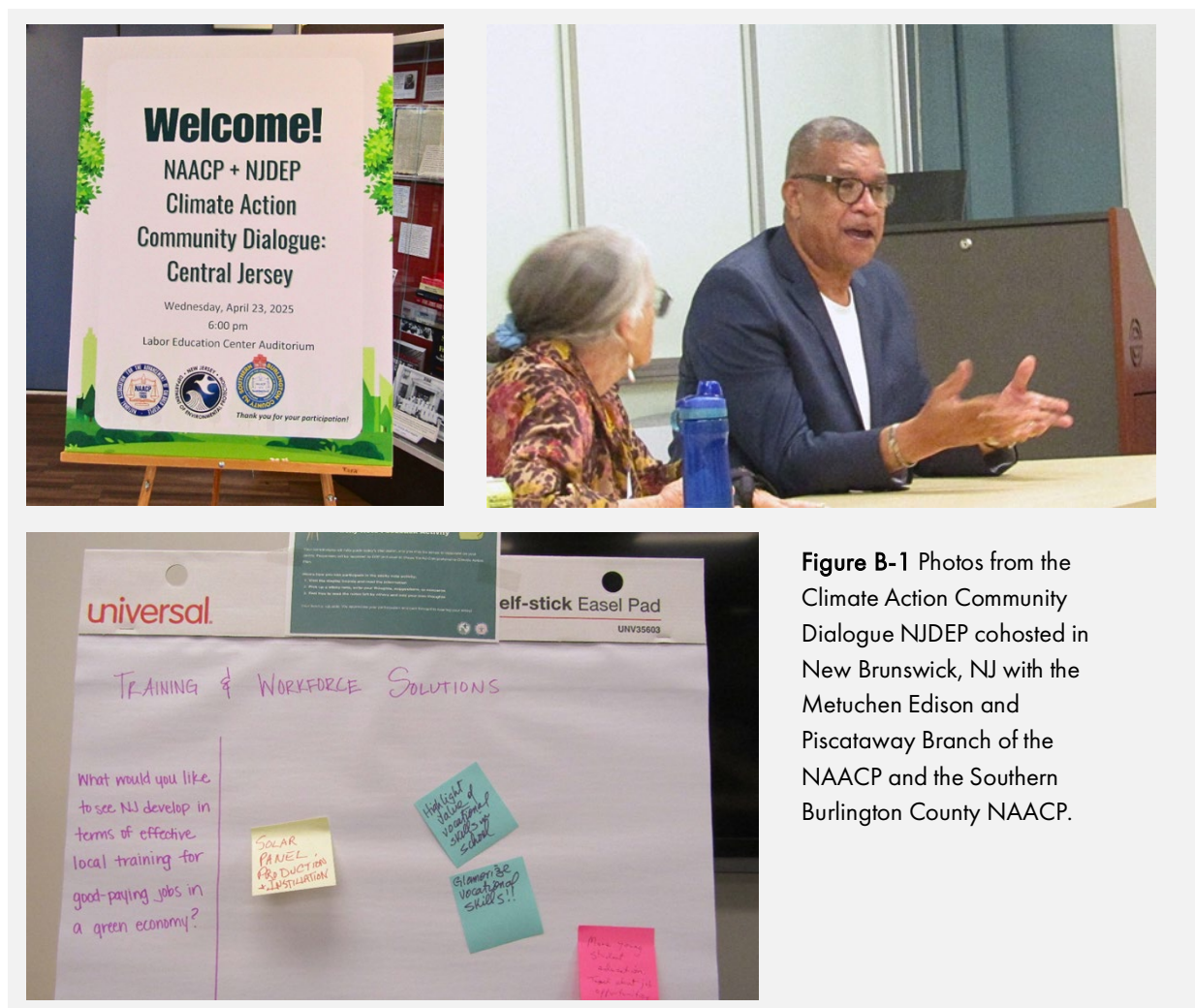


Figure B-1 Photos from the Climate Action Community Dialogue NJDEP cohosted in New Brunswick, NJ with the Metuchen Edison and Piscataway Branch of the NAACP and the Southern Burlington County NAACP.

CPRG Engagement Sessions and Key Takeaways:

North Jersey / Newark Climate Action Community Dialogue

In December 2023, NJDEP hosted an in-person dialogue in Newark with over twenty residents and members of Newark Water Coalition, New Jersey Environmental Justice Alliance, South Ward Environmental Alliance, Ironbound Community Corporation, City of Newark Office of Sustainability, and Clean Water Action. While this feedback informed much of the NJ Priority Climate Action Plan (PCAP), the subsequent sessions followed up on and continued this conversation, and the community input from this event was also central to this CCAP. The discussions focused on four key themes.

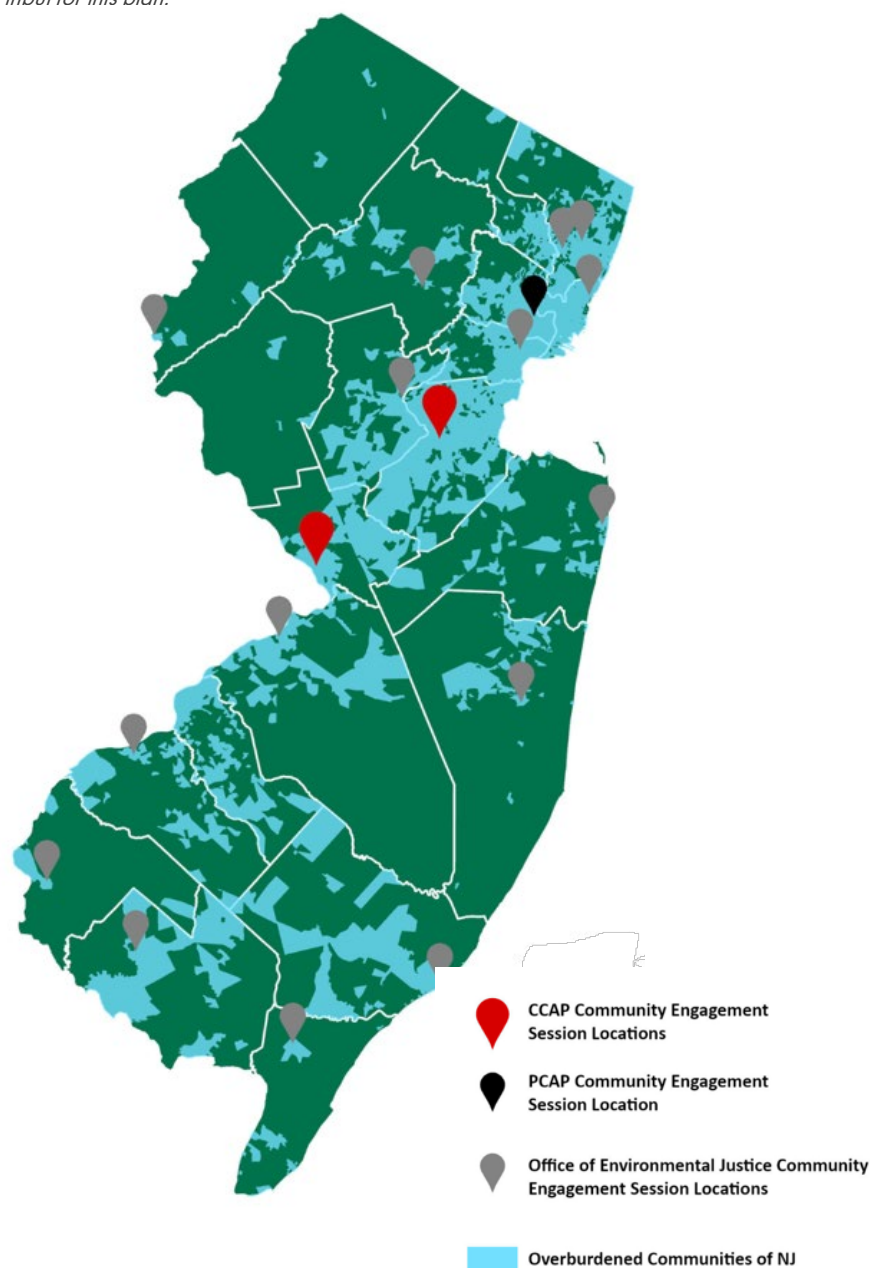
Workforce development was a major point of discussion, with participants emphasizing the need for accessible training in renewable energy, especially solar technology, and the inclusion of union access and opportunities for undocumented and formerly incarcerated individuals. Another theme was place-based climate action, where residents supported the creation of eco-village pilot projects to build local resilience, train workers, and engage youth. Participants also advocated for expanding community composting and promoting urban farming as part of organic waste solutions. Finally, on the topic of air pollution, residents stressed the need to regulate toxic air pollutants and suggested creating zero-emission zones near ports, establishing an advisory committee for longshoremen, and raising concerns about projects like the NJ Turnpike expansion and fossil-fueled power plants.

Central Jersey / New Brunswick Climate Action Community Dialogue

Held on April 23, 2025 by NJDEP and co-organized by NAACP, this in-person session at Rutgers University reinforced many previously identified concerns and introduced new local issues. Attendees included fifteen residents and members of the North Brunswick Environmental Commission, South Brunswick Environmental Commission; Metuchen, Edison and Piscataway Branch of the NAACP (MEAB); NAACP Southern Burlington County; the NJ Progressive Equitable Energy Coalition (NJPEEC); and CAIR Action; plus several DEP AEMS Staff. This session emphasized issues related to

Figure B-2. NJDEP-hosted Community Engagement Sessions Informing New Jersey's Comprehensive Climate Action Plan

The map shows the locations of community engagement sessions held across New Jersey by the Department. Input and comments gathered during these sessions informed the development of the Comprehensive Climate Action Plan (CCAP). Sessions were conducted both in person and virtually. As part of the development of the NJ's Priority Climate Action Plan (PCAP), DEP hosted a session in Newark for North Jersey residents and community members—marking the first in a series of planned conversations under the CPRG grant. DEP co-hosted additional stakeholder engagement sessions for the CCAP with local community organizations and leaders in New Brunswick for Central Jersey residents and a series of three virtual calls with community stakeholders and residents in South Jersey and Central Jersey to accommodate those unable to travel to in-person events. The NJDEP Office of Environmental Justice hosted community listening sessions across the State from 2021-2025. Comments from these sessions were also considered among the community input for this plan.



transportation and air pollution, including diesel truck emissions, vehicle idling, a lack of EV infrastructure, and insufficient public transit options.

Development concerns were also a significant topic, with participants noting that warehousing and data centers increase pollution and displace community needs. Attendees highlighted that incinerators disproportionately impact vulnerable communities and that low-income households face significant barriers to accessing incentives and retrofits. Participants called for the need for public awareness and education through accessible, multilingual climate materials and better education on impactful actions. Finally, support was voiced for sustainable infrastructure such as more solar and offshore wind, as well as the expansion of electric buses.



South and Central Jersey Climate Action Virtual Community Listening Sessions

To ensure accessibility for residents who may not be able to attend in-person events, webinars were held in June 2025 co-organized by NAACP, and included over twenty three residents of Bellmawr, Bridgeton, Edison, Glassboro, Lawrenceville, Pennsauken, Salem, Westhampton, and West New York township, and a resident of Monmouth County; as well as representatives from the Burlington County NAACP; Camden County Municipal Utilities Authority (CCMUA); Clean Water Action; the Climate Revolution Action Network; the Emerald Cities Collaborative; the Environmental Justice Law Center; South Brunswick Environmental Commission; the Metuchen Edison Piscataway Area Branch of the NAACP; the NJ Environmental Justice Advisory Committee (EJAC); the NJ Environmental Justice Alliance (NJEJA); and NJ Future; plus several DEP staff from the Division of Climate Mitigation and Monitoring.

These sessions allowed the NJDEP to hear directly from community members on climate and air pollution priorities. A recurring theme was the need for more education and engagement, with requests for communications led by scientists and materials translated into multiple languages. In terms of equitable access to clean, affordable energy, attendees believed that home energy rebates were too low to be "actually affordable" for low- and moderate-income residents and that South Jersey's older electric transmission infrastructure needs to be prioritized for upgrades. Regarding land use and development, concerns were raised about warehouse development in residential areas and the need for legislative action to regulate it. On transportation, participants noted a deficit of public transit and supported expanding bus services and accelerating the electrification of school buses. A strong priority for waste and incineration was to remove the ability for incinerators to receive renewable energy credits. Finally, in workforce development, attendees called for a "one-stop-shop" for jobseekers to find information on green job training and apprenticeship opportunities and expressed concerns about union control over green jobs.



Phase 4: Synthesis and Summary

To reflect community input, NJDEP synthesized feedback from outreach—community meetings and listening sessions—into key themes and priorities issues that are documented in “EJ Community Priorities for Climate Action” document. This document was shared with the EJAC and meeting participants for validation and additional input. This iterative process ensured that community concerns are accurately captured and meaningfully integrated into the CCAP. By closing the feedback loop, NJDEP intends to reinforce trust, support equitable policy development, and ensure the final plan reflects the lived experiences and priorities of impacted communities. For example, during this stage, members of EJAC commented that concerns about climate mitigation projects’ impact on housing stability or “green gentrification,” that are often heard in local planning contexts and community meetings were not brought up at the CCAP engagement sessions but are nonetheless important considerations, particularly for the state’s low-income residents and OBCs. These concerns including the displacement pressures that can follow from home retrofits, rises in flood insurance premiums, neighborhood tree planting and park development, resilience projects, or climate buyouts, were added into the priorities document accordingly.

Phase 5: Incorporation into the CCAP

The CCAP aims to be a community-driven document, and as such, a discussion of the community priorities identified through the engagement process have been included in each relevant GHG emissions sector chapter in the plan, and where possible, shaped the measures or enabling actions DEP identified in the plan itself. “EJ Community Priorities for Climate Action” document is a summary of the core principles and thematic priorities identified through this public engagement process and is included below.

EJ Community Priorities for Climate Action: A Summary of Key Takeaways

This document summarizes the climate priorities and concerns of environmental justice (EJ) communities across New Jersey. These priorities, drawn from a robust, statewide public engagement process, are intended to shape the New Jersey Comprehensive Climate Action Plan (CCAP).

The insights presented here are based on a comprehensive review of prior feedback from over 45 sources, including public engagement sessions, listening sessions held by the New Jersey Department of Environmental Protection (NJDEP) since 2018, and public hearings for the State's 2024 Energy Master Plan. By synthesizing feedback from diverse sources, NJDEP has created a foundation to inform its climate plan that is rooted in community experience and directly addresses the priorities of those most affected by pollution and climate risks.

Core Principles

- **Prioritize Overburdened Communities:** Community members believe that focusing on reducing risks in overburdened communities will protect the most vulnerable populations first, creating a "trickle-up" benefit for all New Jerseyans.¹ EJ communities should be central to decision-making, and there should be a process of "informed, pre-consent" for technological investments.^{2 3}
- **Center Place-Based, Holistic Approaches:** Solutions should be tailored to the unique needs of each community.⁴
- **Foster Community Ownership:** Fostering local involvement and giving communities ownership of climate action is seen as crucial for creating sustainable and equitable solutions.³
- **Elevate and Energize Education and Engagement:** There is a need for better education on local environmental decision-making processes, particularly "Your Planning and Zoning Boards: 101" seminars. Educational materials should also be translated into multiple languages to reach historically underrepresented communities. Scientists should lead communications about climate change.³ Libraries, churches, and senior groups were cited as important avenues for distributing information about energy-related incentive programs.⁵

Key Priorities by Topic

1. Emissions Reduction

- **Reduce Co-pollutants and GHG Emissions:** Participants called for the equal prioritization of reducing co-pollutants and greenhouse gas (GHG) emissions. They emphasized using zero-emission technologies and requiring mandatory emission reductions from power plants in EJ communities.^{6 3}
- **Phase Out Fossil Fuels:** A rapid phase-out of fossil fuels and a transition to clean, renewable technologies is a top priority.⁷ There is opposition to technologies like carbon capture utilization and storage and hydrogen co-firing, which are seen as perpetuating fossil fuel use.⁶

2. Equitable Access to Clean, Affordable Energy

- **Improve Affordability and Accessibility:** A just transition to clean energy must focus on affordability, especially for low-income communities and renters. There is a desire for larger and more numerous home energy rebates that make the switch to electric "actually affordable" as existing rebates are considered inadequate.^{3 5}
 - Most participants were unfamiliar with New Jersey Clean Energy Programs or other utility assistance programs, or they found it difficult to find out about them. There was a concern that low participation could lead to programs being cut.⁵

- **Expand Equitable Electrification Incentives:** Support exists for expanding electrification incentive programs for low-income households, including a "whole home" approach to retrofit older homes. The state should also ensure that renters benefit from these improvements without facing rent increases.³
- **Upgrade Electric Generation Infrastructure:** The state should prioritize infrastructure upgrades needed to bring clean energy to certain communities, particularly in South Jersey where transmission is older and less expansive.^{8 3}

3. *Opposition to Misrepresented "Clean" Technologies*

- **Eliminate Waste Incinerators:** There is strong opposition to waste incinerators, which are seen as harmful energy sources that disproportionately affect EJ communities with high emissions of toxic pollutants. Communities advocate for disqualifying incinerators from Renewable Portfolio Standards and stopping them from receiving renewable energy credits.^{5 3 9}
- **Prioritize Solar, Wind, and Battery Storage:** Community members generally want the state to prioritize expansion of solar, wind and battery storage to meet energy goals. However, several community members and organizations oppose pursuing nuclear energy, hydrogen, and liquified natural gas to meet clean energy goals, advocating instead for an exclusive focus on solar, wind, and battery storage.^{3 5}

4. *Zero-Waste Solutions*

- **Adopt Zero-Waste Strategies:** There is strong support for zero-waste strategies to reduce incineration and pollution. Some participants felt that a full shift to zero-waste was not currently doable due to the required lifestyle changes.^{3 5}
 - Other solutions noted by participants included a \$1 charge for takeout containers, a deposit-based system like a "bottle bill," and policies that incorporate recycling costs into the product itself.⁵
- **Take High-Priority Actions:** Key actions include banning new incinerator construction, strengthening enforcement of permit violations, and incentivizing community composting.² Advocates also recommend incentivizing waste reduction and "circular economy" programs.

5. *Transportation*

- **Electrify and Expand Transit:** The focus for transportation solutions should be on electrifying fleets, incentivizing micromobility (like e-bikes and scooters) and expanding public transit service and reliability.³
- **Expand Public Transit Infrastructure:** Participants noted a deficit of public transit in South Jersey and supported expanding bus services, including later hours and additional stops, as well as projects like the Glassboro-Camden light-rail. There is also a need for safe walking and biking infrastructure, and funding for "complete streets" projects.³
- **Electrify School Buses:** Accelerating the electrification of school buses was identified as an urgent need.³

6. *Land Use and Development*

- **Regulate Warehouse Development:** Concerns were raised about warehouse development in residential areas, with towns reportedly going against their own zoning for "rateable benefits," leading to concerns about increased traffic and air pollution.³ Participants felt that environmental commissions had little say or influence on development projects in their communities that would have significant impact on emissions.^{3 5} Many were interested in DEP doing more to support public education about "climate-smart" land use planning principles, and how to engage or join local planning and zoning boards.³

- **Reform Brownfield Policies:** There is a desire to reform brownfield redevelopment policies that currently disincentivize clean-up and lead to development on "greenfields".³
- **Protect Indigenous Rights:** Virtual sessions noted that New Jersey's native communities often feel exploited and excluded from land policy conversations. There was a desire for the state to reverse current policy that prevents Indigenous people (and other New Jerseyans) from foraging on the land.³
- **Pair climate investments with affordability and anti-displacement measures:** EJAC members highlighted that concerns about climate mitigation investments impact on housing stability or 'green gentrification', are critical issues often brought up in community meetings and local planning contexts in NJ. Possible anti-displacement measures include rent protections, community land trusts, equitable buyout policies. These would help address displacement pressures that can follow home retrofits, rises in flood insurance premiums, neighborhood greening, resilience projects, transit-oriented development, upzoning, or climate buyouts.

7. Workforce Development

- **Diversify Union Hiring:** A major concern is the control that unions have over green jobs, particularly in offshore wind projects, and their reluctance to diversify hiring practices.³ A discussion between the NJ Department of Labor and union leaders is desired to ensure equity in green careers.³ Participants emphasized the importance of training and employing women and other underrepresented groups in new green economy jobs.⁵
- **Centralize Job Resources:** There is a need for a "one-stop-shop" for job seekers to find information on green job training and apprenticeship opportunities.
- **Invest in Training and Education:** The group agreed that there is a lot of potential to train and employ residents as electricians, roofers, solar panel installers, and electric bus/HVAC technicians, but investments in workforce development programs are needed.⁵
 - Suggestions included providing paid training or apprenticeships, expanding apprenticeship opportunities, and bringing back trade/tech education in schools where it has been cut.
 - Participants also suggested communication and marketing campaigns to "glamorize" the trades to attract young people.
 - All participants supported a small local tax to fund expanded vocational programs at high schools, technical schools, and community colleges.⁵

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APPENDIX C

GREENHOUSE GAS REDUCTION MEASURES
QUANTIFICATION METHODOLOGY

Introduction

The quantification of greenhouse gas emissions found in this Comprehensive Climate Action Plan (CCAP) uses data from federal government sources (e.g., USEPA, EIA, and the USDOE), state government sources (e.g., various New Jersey Department of Environmental Protection (NJDEP) reports), and others. NJDEP sought to use the most recently available data that were consistent, reliable, and high quality. All estimates were calculated using a 100-year Global Warming Potential (GWP₁₀₀), with estimates based on the 20-year Global Warming Potential (GWP₂₀) also presented for comparison where that information provides useful insight. The cumulative emissions reduced in the near term (2030-2035) and long term (2050) were quantified for each measure where practical, as were annual emissions reduced over the 2025-2050 time frame.

However, a note of caution is due with respect to interpreting the emissions reduction projections in this plan. Many of measures described in the plan affect other measures. For example, creating a clean energy standard for the electricity sector and simultaneously subsidizing installation of solar photovoltaic panels will work together to accelerate emissions reductions, but it is difficult to attribute those emissions reductions to one or the other of the two measures. The quantification of emissions reduction benefits in the CCAP often describe how these actions will perform in isolation, and as a result their individual contributions cannot simply be added together to find a grand total of emissions reductions for the State. However, the modeling conducted for the CCAP does have the ability to account for the many interactions that take place in the economy and across sectors, and provides an estimate of the overall effectiveness to be expected from the combined policies.

The overall scenarios and sector-wide projections discussed in this report were developed by the Board of Public Utilities and their contractor, Energy and Environmental Economics (E3), as part of the State's Energy Master Plan (EMP) development. This work used the E3 Pathways model (Energy and Environmental Economics, 2025), the Energy Exemplar PLEXOS electricity dispatch model (Energy Exemplar, 2025), and the USEPA COBRA health benefits analysis model (USEPA, 2025a), and was based on assumptions reflecting New Jersey and US policies current at the time of development.

1. Transportation GHG Emissions Reductions Calculations

GHG Reduction Measures:

1.1 Continue to implement all current policies and expand current transportation electrification programs

The principal current policies are the Advanced Clean Cars II (ACC II) rule and the Advanced Clean Trucks (ACT) rule. Modeling for the 2024 Energy Master Plan included these two rules in the Current Policy scenario but not in the BAU scenario, and there were no other significant differences in policies between the two scenarios in this regard. As a result, the emissions reduction benefits from the current policies were taken as the difference between on-road vehicle emissions in the two scenarios. ACC II was assumed to be limited to the light-duty vehicle category in the model output and ACT was assumed to apply to the medium- and heavy-duty categories. This approach assumed there is no overlap between the domains of the two rules, although in reality there is overlap in coverage at the transition from light-duty to medium-duty. The implementation of ACC II in the model assumed 100% light duty vehicles (LDV) EV sales by 2035, consisting of 80% battery electric vehicles and 20% plug-in hybrid electric vehicles. ACT was modeled as between 40% and 75% medium- and heavy-duty zero emission vehicle sales by 2035, depending on vehicle weight class.

The CCAP scenario further assumed a decreasing proportion of hybrid light-duty electric vehicles after 2025, reaching 100% battery electric by 2050. It also assumed 100% zero-emissions medium- and heavy-duty truck sales

by 2050, with the availability of some fuel cell vehicles in this category as well as battery electric. Bus sales were assumed to increase to 100% zero-emission vehicles by 2050 for all types, compared to the Current Policy scenario in which 50% of public transit bus sales would be zero-emission by 2026 and 100% by 2032 (or 4% and 8% of total bus sales, respectively).

1.2 Implement a GHG reduction planning standard for state and MPO transportation plans

The impact of vehicle miles traveled (VMT) reductions were estimated by scaling down the existing emissions outputs from the 2024 NJ Energy Master Plan's Pathways model Demand Management Scenario for Transportation Light Duty Cars and Transportation Light Duty Trucks (VMT reduction measures were not applied to the other medium and heavy duty subsectors). To scale 3% overall reduction in statewide light duty VMT by 2050, DEP assumed a consistent annual reduction in LDV emissions from reduced VMT starting in 2027, to total a 3 percent reduction by 2050. For example the total light duty transportation emissions (from combustion engines) in 2050, are 1.134 million metric tons (MMT) carbon dioxide equivalent (CO₂e). Since the Demand Management Scenario (DMS) already includes a 3% reduction in statewide light-duty VMT (NJBP, 2025), this measure seeks to compare the sum of direct LDV emissions and the upstream electricity emissions associated with vehicle charging in the DMS and those emissions in a modelled scenario without that 3% reduction. For example, total direct LDV emissions without this reduction in 2050 would be $1.134 / (1 - 0.00125) = 1.1355$ MMT CO₂e. So the 0.125% VMT reduction in that year leads to avoided emissions equal to the difference of those two figures (~1,400 metric tons (MT) CO₂e reduction). This same approach was then applied to the electricity emissions associated with LDVs in each year. The sum of these annual emissions avoided benefits equals 2,350 MT CO₂e in 2050. The cumulative total emissions avoided by 2050 (both direct emission from reduced tailpipe emissions and the associated electricity emissions from light duty electric vehicles (LDEVs) are estimated to be 254,168 MT CO₂e or 0.254 MMT CO₂e. These estimates also assume the state achieves transportation electrification targets and that 100% of light-duty vehicles sold in the state are zero-emissions by 2035. Annual avoided emissions from fewer LD VMT are greatest in the short term, because there are more fossil-fueled light-duty vehicles assumed to be on the road in the near term than in future years. Estimates also assume that the state builds out renewable capacity as described in the 2024 EMP Demand Management Scenario ("CCAP Scenario") and meets its clean energy targets.

1.3 Implement large-scale public transit projects and policies to increase transit ridership

NJTRANSIT provided DEP with forecasts of the expected growth in passenger train, bus and light rail train ridership in 2050 under low and high ridership scenarios, assuming full implementation of the regional Gateway Program which is anticipated to provide the majority of the growth in ridership. The high rail estimate, and low bus/LRT (light rail transit) estimates assume full completion of the Gateway Program. Bus and LRT ridership decreases in that scenario as more people divert to the rail system. However, total transit ridership will increase assuming the Gateway scenario.

NJ DEP estimated light-duty VMT avoided from the increased number of transit trips that would displace car trips following the American Public Transportation Association (APTA)'s method (APTA, 2019), if NJ Transit ridership increases from 2025 to 2050 following the forecasted growth rates associated with full completion of the Gateway Program ("high" Passenger rail and "low" Light rail and Bus rates). In the APTA method, VMT avoided is equal to forecasted increase to passenger miles travelled as a result of the ridership increase multiplied by a mode-shift factor or "MSF" (the ratio of transit passenger miles to displaced private auto miles).

$$\text{Vehicle Miles Avoided} = \text{Increased Passenger miles travelled} * \text{Mode Shift Factor}$$

The calculations here used a mode-shift factor of 0.508 which is APTA's default MSF for less-densely populated service areas (serving less than 1,000,000 people). This was chosen because NJ Transit serves multiple communities, most of which are less than one million people and APTA report recommends using the population-based factor for all modes as a default. Baseline passenger miles and trips were based on NJ Transits' 2024 At a Glance Factsheet

(NJ TRANSIT, 2025), which provided the most recent/best available figures for the NJ Transit system. In the “high” Passenger rail and “low” Light rail and Bus ridership growth rate scenarios total avoided VMT in 2050 is 592,348,828 miles.

DEP estimated the direct GHG emissions avoided from reduced on-road LDV miles travelled following the American Public Transportation Association (APTA)'s method and assumed that all new transit trips/rides would be replacing gasoline car vehicle trips. Total VMT avoided in 2050 as a result of the transit ridership increase is multiplied by light duty fuel efficiency of 22.2 miles/gallon (USEPA, 2023a). Gallons of gasoline avoided is multiplied by USEPA's gasoline emissions rate of 0.008887 MT/gallon. Total emissions avoided in 2050 from the “high” Passenger rail and “low” Light rail and Bus ridership growth rate scenarios (NJ Transit's optimal growth scenario) is 0.237 MMT CO₂e. Cumulative emission reductions by 2050 are 2.73 MMT CO₂e. This assumes that the transit ridership increases over a 23-year time frame, which was chosen because the Glassboro-Camden Line (GCL) is estimated to be completed in 2028.

These estimates assume existing bus routes would be sufficient to carry the added passengers, that increased vehicle weight would not significantly reduce energy or fuel efficiency, and that any increase in the number of stops or their duration would be small. These estimates also assume there is no overall growth in statewide, light-duty VMT by 2050. Overall growth in statewide, light-duty VMT could counteract the benefits of growth in transit ridership. Also, neither of these estimates include the upstream emissions avoided from reduced EV-related electricity demand or indirect emissions reductions from reduced congestion or land use effects of transit-oriented development (e.g. compact development). The estimate assumes that all new transit trips/rides would replace gasoline car vehicle trips.

1.4 Explore new pricing mechanisms, and other transportation alternatives that reduce VMT and emissions

GHG emission reductions from continuation and further implementation of a telework or work-from-home” in the State directly reference the Pathway 4B estimates generated through the analysis completed for the 80x50 report (NJDEP, 2020). Pathway 4B is a more aggressive work-from-home scenario, where 20% of the state's workforce start to work from home in 2020, increasing to 40% in 2035, and holding steady at 40% through 2050. Initial emission reductions are 2.6 MMT CO₂e, and 6.1 MMT CO₂e by 2035. Cumulative emissions reductions in this case reach 161 MMT CO₂e by the end of the period.

NJDEP did not estimate potential GHG reductions from new transportation pricing mechanisms since that would depend on the exact type and design of mechanism(s) which have not yet been determined.

2. Residential & Commercial Buildings GHG Emissions Reductions Calculations

GHG Reduction Measures:

2.1 Accelerate heat pump installations

Projected emissions reductions from residential and commercial heat pump adoption were based on model output from the 2024 EMP. The total emissions from fossil-fuel powered space heating and water heating in the residential and commercial sectors in the CCAP scenario were compared with totals for the Current Policy scenario. The difference was taken as the benefits of added policies needed to reach the CCAP emissions reduction objectives.

2.2 Adopt a Clean Heat Standard

To assess emissions reductions benefits of the Clean Heat Standard (CHS) measure, the example of the Colorado CHS statute (SB21-264, 2021) was adapted for the residential and commercial sectors based on a 2021 emissions baseline for natural gas and fuel oil consumption. Categories of emissions included residential space heating, water heating, cooking, clothes drying and other applications; commercial emissions including space heating, water

heating, air conditioning, cooking, and other applications. For 2027, an emissions cap was established 1% below the 2021 baseline level. Each subsequent year the cap descended an additional 1% to reach 4% in 2030. For years 2031 through 2035, the cap descended 3.6% each year, reaching 22% reduction below 2021 levels in 2035. After 2035, the cap remained at 22%. Emissions under this cap were then compared to emissions under the 2024 EMP Current Policy Scenario. If Current Policy emissions exceeded the CHS cap, the additional reductions imposed by the CHS cap were taken as an emissions reduction benefit from the policy. If current policies did not exceed the cap, it was assumed the CHS resulted in no additional reduction. Since current policies will result in gradual lowering of GHG emissions and the CHS as modeled stops descending from 2035, the added benefit of the CHS decreases approaching 2050. The emissions reductions when compared to current policies were 0.6 MMT in 2030, peaking at 3.1 MMT CO_{2e} in 2035, and then gradually decreasing to 1.5 MMT CO_{2e} in 2050. Cumulative emissions reductions were 2.6 MMT CO_{2e} in 2030, 12.2 MMT CO_{2e} in 2035, and 40.2 MMT CO_{2e} in 2050.

2.3 Upgrade building envelopes

Emissions reductions from building envelope improvements were based on model output from the 2024 EMP. Two categories of retrofit, basic and enhanced, were used. Basic retrofits reduced space heating emissions in a residence or commercial building by 32% and enhanced retrofits reduced space heating emissions by 38%. Emissions reductions were applied to buildings having emissions rates as represented in the Current Policy scenario. The quantities of retrofits were as determined by the CCAP scenario. No retrofits occurred in the Current Policy scenario, so the benefits arose from the new measure only.

2.4 Establish all-electric building codes

The emissions reductions that would be realized from an all-electric building code, over and above what will be achieved by other emissions policies, are difficult to ascertain because the policies overlap. That said, they would introduce certainty and provide a clear standard which design professionals could adhere to. Such standards also clarify what can be expected in a building of a certain age, allowing potential buyers and tenants to understand potential costs of occupancy.

The uncertainties notwithstanding, it is possible to estimate the scale of potential reductions by looking at the number of new buildings constructed in the state and comparing the all-electric case against the conventional, fossil-fueled case. It is estimated that around 38,000 residential housing units are constructed in the State each year and 39 million square feet of new commercial floor space is added. Using the same energy efficiency and emissions assumptions as the 2024 EMP modeling, and in the absence of other policies affecting adoption of electrified alternatives and energy efficiency measures, applying an all-electric new construction code in the residential sector would result in annual GHG emissions reductions of 0.8 MMT CO_{2e} by 2030; 1.6 MMT CO_{2e} by 2035, and 3.9 MMT CO_{2e} by 2050. In the commercial sector, emissions reductions would be 0.5 MMT CO_{2e} by 2030; 1.0 MMT CO_{2e} by 2035; and 2.6 MMT CO_{2e} by 2050. Cumulatively, residential emissions reductions would be 2.3 MMT CO_{2e} by 2030; 8.6 MMT CO_{2e} by 2035; and 50.1 MMT CO_{2e} by 2050. Cumulative commercial reductions would be 1.6 MMT CO_{2e} by 2030; 5.8 MMT CO_{2e} by 2035; and 34.0 MMT CO_{2e} by 2050. Combined annual emissions for both residential and commercial sectors would be reduced by 1.3 MMT CO_{2e} by 2030; 2.6 MMT CO_{2e} by 2035; and 6.5 MMT CO_{2e} by 2050. Cumulative emissions for the combined sectors would be reduced by 3.9 MMT CO_{2e} by 2030; 14.3 MMT CO_{2e} by 2035; and 84.7 by 2050.

2.5 Adopt statewide Building Performance Standards

Introducing a building performance standard (BPS) policy will require critical evaluation, including review of performance and compliance data gleaned from the existing benchmarking program. And because a BPS will touch on a wide range of stakeholder interests and economic activities, it is essential to evaluate circumstances early in the program development process. Towards that end, Rutgers University is engaged in a four-year research project on behalf of the Board of Public Utilities to explore BPS policy options and lay the groundwork for policy design. Since

research is ongoing, this CCAP does not attempt to quantify potential future emissions reductions from such a program, but the BPS is included in this CCAP in recognition of the commitment the State has made.

2.6 Adopt Zero Emissions Standards for space and water heating

In projecting potential emissions reductions of a Zero-Emissions Heating Equipment Standard (ZEHES), the same projected equipment lifetimes are used from the 2024 EMP modeling (NJBPU, 2025) (based USEIA NEMS, 2020 RECS, and other sources). The ZEHES emissions analysis demonstrates the importance of early action where equipment with long lifetimes are allowed to reach the end of their serviceable lives before replacement. For example, based on the equipment life expectancies used in the EMP modeling, a heating system installed in a single-family residential structure in 2028 could have a median replacement date of 2049. But units begin failing at substantially greater rates thereafter and virtually all have been replaced by 2060. This can be seen in the projected emissions from space and hot water heating under a model ZEHES rule, assuming the Current Policy scenario played out through 2028 and the ZEHES governs equipment replacement from 2029 onward. When compared to emissions reductions the Current Policy scenario, the added benefits of the ZEHES are greatest in the years between 2040 and 2050. In 2030, the ZEHES would reduce emissions by an additional 0.2 MMT CO₂e each year when compared to current policies, and only 0.3 MMT CO₂e in 2035. But by 2050, as aging units finally reach the end of their serviceable lives, the emissions benefit rises to 6.1 MMT CO₂e. The small residual tail of fossil-fueled equipment remaining in service after 2050 would essentially be replaced in the following decade, terminating emissions from this equipment category. The cumulative emissions reductions under the ZEHES compared to the current policy scenario would be 0.9 MMT CO₂e in 2030; 2.2 MMT CO₂e in 2035, and 40.2 MMT CO₂e in 2050. These estimates are based on a ZEHES acting alone in the context of current policies, and do not consider the supporting benefits of additional measures. A ZEHES in combination with other policies will assure effective emissions reductions under a range of future conditions. It should also be noted that these projections assumed that all fossil fuel-powered space heating and water heating equipment would be subject to the ZEHES. The initial version of the NESCAUM model rule only applies to small and mid-sized systems, but provisions have been made in the model rule with the intention to expand it to cover a wider range of equipment.

2.7 Lead by example by decarbonizing State, county and municipal resources

The state is still gathering the info necessary to develop a specific emissions reduction estimate for the LBE effort. However, these emissions reductions are generally included in the CCAP under strategic measures such as accelerated adoption of heat-pumps.

3. Electricity Generation and Demand GHG Emissions Reductions Calculations

GHG Reduction Measures:

3.1 Revise RGGI rule to conform with 2025 Program Review model rule

Emissions reduction benefits from the proposed program revisions were based on modeling analysis by ICF International on behalf of the RGGI states. Modeling of the electric sector was conducted using ICF's Integrated Planning Model (IPM) and are published on the RGGI web site (RGGI, 2025). Evaluation for the CCAP was based on RGGI Case B, which accounts for clean energy policies and programs present in statute and rule.

Newer base year emissions data is available than was available when modeling was conducted. Specifically, emissions from RGGI-regulated facilities in New Jersey were 9.8 MMT CO₂ in 2024, (RGGI, 2024).¹ Further, the

¹ Based on USEPA CAMD emissions records (USEPA, 2025b). Emissions have been adjusted to account for compliance obligation adjustments associated with combined heat and power cogeneration facilities in NJ regulations.

first year for which model output was available was 2028, although the new rule provisions are anticipated to become effective in 2027.

To incorporate the recent emissions data, percentage annual reductions seen in the model were used to adjust the 2024 emissions such that the fraction of emissions avoided in the model was applied to the actual emissions from regulated facilities. Since model data began in 2028, anticipated reductions between 2024 and 2028 were accounted for in the CCAP analysis. For 2025 and 2026 emissions, it was assumed that they would decrease at 3.5% annually, the rate at which allowance offerings will decrease. For 2027 emissions, it was assumed that they would decrease at the same annual rate seen in the model between 2028 and 2030. For years after 2037, emissions were assumed to remain constant in light of the fact that the number of allowances sold at auction will remain constant. However, it should be noted that the availability of saved (banked) allowances and additional allowances from the auctions cost containment reserves can influence emissions independent of the number of allowances offered for sale at auction.

3.2 Implement a 100% Clean Electricity Standard

A 100% clean electricity standard was incorporated into modeling for the CCAP Scenario. Sector-wide emissions estimates therefore reflect the benefits of this measure. However, because this measure is not independent of other measures, no attempt was made to isolate its effect.

3.3 Reduce peak demand through adoption of electricity rate designs and policies to support load flexibility

Peak reduction and demand management strategies were included in the CCAP scenario modeling and the emissions reduction benefits of demand management are reflected in the results for the sector. However, because this measure is not independent of other measures, no attempt was made to isolate its effect.

3.4 Support continued availability of existing resources necessary for the energy transition

This measure will avoid the potential consequences of lapses or lost infrastructure rather than lead directly to reduced emissions. As a result, no attempt was made to quantify the specific emissions reduction benefits of the measure. However, avoided emissions could be significant if lost infrastructure were replaced with fossil-powered alternatives.

3.5 Support development of an additional 6.2 GW solar photovoltaic capacity

To estimate the emissions reduction benefits of solar PV addition, a counterfactual based on combined cycle natural gas generation was used. That is, if the solar PV were not built, and combined cycle natural gas were used instead, what increase in emissions would result? USEPA eGrid emissions records from the sixteen combined cycle facilities active in New Jersey during 2023 were used to establish the emissions rate for the counterfactual (USEPA, 2024). The combined CO₂e emissions rate for the sites was 822 Lbs/MWh. Capacity factors were taken from the 2024 USDOE NREL Annual Technology Baseline Report (NREL, 2024), using the moderate scenario projections for Class 8 solar PV resources.

3.6 Continue to support the development of 11GW of offshore wind by 2040

Emissions reduction benefits were found by applying the same combined cycle natural gas counterfactual used to evaluate the solar PV measure discussed above. Capacity factors were from NREL (2024), using the moderate scenario and Class 3, fixed bottom resources.

3.7 Support the development of 2GW of new nuclear energy generation sources by 2050

Emissions reduction benefits were found by applying the same combined cycle natural gas counterfactual used to evaluate the solar PV measure discussed above. A capacity factor of 0.93 was used, based on NREL (2024). To estimate cumulative emissions, it was assumed the reactor(s) would come online in 2040.

3.8 Support deployment of an additional 13.5 GW of energy storage capacity and comprehensive grid improvements

Expansion of energy storage was included in the CCAP scenario modeling and is reflected in the emissions reduction results for the sector. However, because this measure is not independent of other measures, no attempt was made to isolate its effect.

3.9 Invest in the development of 7 GW innovative energy technology

Emissions reduction benefits were found by applying the same combined cycle natural gas counterfactual used to evaluate solar PV as described above. Emissions reduction estimates were based on the hypothetical deployment of an additional 7 GW of nuclear power with an assumed capacity factor of 0.93 based on NREL (2024) and coming online in 2045.

4. Industry GHG Emissions Reductions Calculations

GHG Reduction Measures:

4.1 Adopt manufacturing equipment efficiency standards and incentives for energy efficient technologies in manufacturing

DEP quantified the expected GHG emission reductions associated with improvements to manufacturing energy efficiency through a calculator that E3 developed. This calculator utilized assumptions of the types of annual reductions in energy use that could occur from 2026-2050 in the following industrial manufacturing subsectors: Aluminum; Cement and Lime; Chemicals; Food; Glass; Iron and Steel; Metal Based Durables; Other; Paper; Plastics; Refining; and Wood Products. Typical to state-of-the-art reductions utilized the assumptions from the NREL Industry Energy Tool (McMillan & Narwade, 2018) for industries included in that resource. For other industries manufacturing EE or energy use reduction assumptions from ACEEE Halfway There report were used (Nadel & Ungar, 2019). Percent reduction assumptions in each sector were then applied to manufacturing energy emissions in each subsector by fuel type (Distillate, LPG, and Natural Gas) in the BAU scenario to generate estimates of the avoided emissions from EE improvements by subsector.

NJDEP estimates that if New Jersey were to implement regulations requiring gradual increases in various manufacturing equipment energy efficiency over time in 12 major industrial subsectors, the state could see a reduction in annual industry emissions of about 1.8 MMT CO₂e by 2050, and total cumulative reduction of more than 22 MMT CO₂e by 2050.

4.2 Implement a mandatory emissions reduction program for high-emitting sources in the industry sector

DEP quantified the expected GHG emission reductions associated with a potential program that would establish industrial manufacturing facility emissions standards (set a declining cap on GHG emissions from large-emitting sources) through a calculator that E3 developed. The structure of the hypothetical NJ program and assumptions used were based on Colorado's Greenhouse Gas Emissions and Energy Management for Manufacturing (GEMM) program requirements, in which GEMM1 requires smaller reductions for energy intensive and trade-exposed (EITE) industries (Colorado DPHE, 2025a), while GEMM2 requires larger reductions for other facilities with more than 25,000 MT CO₂e/year of emissions (Colorado DPHE, 2025b). Baseline facility emissions from EPA's GHGRP for 2023 were used to generate list of 21 New Jersey industrial manufacturing sources that emit 25,000 or more MT CO₂e/yr. These sources were made up of the follow industry types: Minerals; Chemicals; Industrial Gas Suppliers; Metals; Petroleum Product Suppliers; Refineries; Pulp and Paper; and Other. Annual emission reductions of 5% by

2032 for EITE industries (collectively) and 20% by 2032 for other industries (collectively) were applied at a linear rate starting in 2026 (1% - EITE; 3% - other industries). This reduction schedule and rate match that of Colorado's GEMM 1&2 program. NJDEP then estimated avoided emissions from industrial facilities under a New Jersey program that would apply additional requirements past the year 2032. These hypothetical requirements included a 10% reduction (EITE industries) and 35% reduction (other industries) in collective GHG emissions by 2039, to estimate the scale of additional reductions the State could expect if it created a program with additional targets.

NJDEP estimates that under a reduce and invest program for industrial manufacturing modelled after Colorado's GEMM, that sets an emission reduction target at 20% by 2032 for industrial manufacturing facilities that emit 25,000 or more MT CO₂e/yr and at 5% by 2032 for EITE industries, New Jersey could avoid more than 709,000 MT CO₂e annually by 2032, and cumulatively reduce industry sector emissions by 15.6 MMT CO₂e by 2050. If New Jersey were to adopt more aggressive reduction targets for these industries that continued past 2032, 10% reduction in emissions from EITE industries by 2039 and 35% from all-other large industrial manufacturing facilities by 2039, New Jersey could avoid more than 1.2 MMT CO₂e in annual industry sector emissions, and cumulatively reduce emissions from the industry sector by more than 23 MMT CO₂e by 2050.

5. Waste and Agriculture GHG Emissions Reductions Calculations

GHG Reduction Measures:

It should be noted that emissions reductions estimates in this sector should not be considered additive. That is to say, that the reductions for Measure 1 and Measure 2 cannot be summed, as some of these reductions would be achieved via enabling actions from Measure 1 or Measure 2. Emissions reductions below are using the 100-year GWP, but were also calculated in some places using the 20-year GWP and footnoted in the narrative.

5.1 Adopt stricter rules for landfill caps and lower threshold for emission reporting and controls at landfills and wastewater treatment facilities

Starting point: Reductions in this sector look primarily at landfill emissions from the in-state disposal of waste in New Jersey. The calculations for how much that is are based on the State Inventory (NJDEP, 2024a), which is based on the SIT Waste module (USEPA, 2025c). Alternatively, we also include a lower-end estimate based on methane emissions from the emissions reported through the Greenhouse Gas Monitoring and Reporting Rule (GHG MRR), of which ~88% of methane emission reported are in the waste sector. The reduction quantification is thus based on reducing emissions from the emissions calculated in the inventory as the upper end of the range, or the emissions reported through the GHG MRR for the lower end of the range. These annual emissions are 3.6 MMT CO₂e based on the most recent inventory, or 0.7 MMT CO₂e based on the most waste sector methane emissions reported through the GHG MRR.

Reductions:

Based on a report from Energy Vision (Lerner, 2025) the measures in this section could reasonably be expected to reduce emissions by 49.1%. This is a national figure given in the report, based on enhanced monitoring and improved collection systems. The measures proposed in the CCAP are broadly aligned with those described in this report. While conditions vary from landfill to landfill and can be highly context dependent, this report was national, and it is expected that these trends at least broadly hold for New Jersey. It is also assumed that enhanced control measures at WWTFs coupled with dewatering could result in a roughly equivalent reduction.

Thus, from a current emissions rate of 3.68 MMTCO₂e currently emitted at in-state and industrial landfills and wastewater plants combined, this could be decreased by 1.81 MMTCO₂e annually. For the cumulative reductions, it was assumed that these control measures would be phased in through 2030 and reach full implementation at that point.

For this measure it is assumed that these reductions can be achieved through a combination of direct control measures (like flaring) as well as improvements in landfill covers, etc.; however it is assumed that reductions will not be greater than 49.1%, applied to the higher top-down approach of the inventory, as well as the lower bottom up estimate of current emissions from the GHG MRR data. Likewise, the measures proposed include things like enhanced monitoring and observations. This continues to assume that emissions uncovered through enhanced monitoring would not be in excess of the emissions estimations provided through the state inventory, nor less than those reported through the GHG MRR, and that reductions would remain no more than 49.1% of total emissions.

Emissions reductions from landfilling of residuals were not directly quantified as there is a lack of data which would make any estimation highly uncertain. However, it is assumed this would cap out at a reduction of no more than an emissions reduction of 49.1% of current emissions.

5.2 Expand regulatory requirements for food waste recycling and diversion

Emissions reductions in this section were based on a few main points of data. First, using EPA's Excess Food Opportunities Map (USEPA, 2025d), NJDEP had estimated that the approximate amount of food waste in New Jersey is about 1.46 million tons/year of landfilled food waste (NJDEP, 2023). This is in line with New Jersey's Food Waste Reduction Act (P.L. 2017, c.136), which uses this figure as a baseline, based on 2017 numbers. Since there has yet to be a full reporting year, this figure was assumed to be current. EPA's 2023 report on Quantifying Methane Emissions From Landfilled Food Waste was also used as a baseline for how much methane is emitted per ton of landfilled food waste – 34 metric tons of methane per ton (2,000 pounds) of landfilled food waste (USEPA, 2023b).

NJDEP used the USEPA Excess Food Opportunities map and GIS software to quantify how many facilities were within 25 and 50 road miles of the two currently operational and two fully permitted food waste recyclers. The Excess Food Opportunities map provides a range of food waste generated (high and low estimates), so this was used to generate a range of estimates based on facilities not currently covered by a 25 road-mile radius but that would be covered by a 50 road-mile radius. Likewise, a similar method was used to estimate the additional food waste that would be captured by utilizing a threshold of 25 tons per year of food waste down from the current requirement of 52 tons per year. This generated a range of estimates based on the high and low estimates of food waste generated by facilities. We assumed a ramp to full implementation in 2030 based on time needed to revise laws and rules, and to complete the two permitted recycling facilities currently under construction to reach full operation.

The emissions reductions assume that food waste takes one of three pathways, and that these are evenly split. The first pathway is that the food waste is never generated at all, thus realizing full emissions reductions as if the food waste never existed. This can represent excess food no longer produced, or food diverted to human consumption via food rescue, for example. The second and third pathways are anaerobic digestion and composting. Both of these use documentation from the organics section of the WARM model (USEPA, 2023c) to quantify emissions reductions. It is assumed that anaerobic digestion is wet digestion with land application of digestate, since this is what current digesters in the state utilize.

5.3 Encourage precision agriculture and utilization of compost on cropland and pasture

The quantification for this measure is based solely on applying compost to 20,000 acres/year of agricultural land. This assumes 20 tons of compost are applied per acre per year (400,000 tons/year) (USEPA, 2023c). Emissions reductions start in 2026, and are fully implemented – that is to say, 400,000 tons/year of compost are applied starting in 2026 through 2050.

Based on the WARM model documentation (USEPA, 2023c) this assumes that 0.03 metric tons of CO₂e are reduced per ton of compost for fertilizer offsets. This amounts to $0.03 * 400,000 = 12,000$ metric tons CO₂e per year in emissions reductions.

The WARM model documentation (USEPA, 2023c) also gives a value of an additional 0.24 metric ton per ton of mitigation through soil carbon storage from compost use. This would be $0.24 \times 400,000 = 96,000$ metric tons per year of CO₂e in mitigation.

If we add these two values together, we get a total of 108,000 metric tons/year of CO₂e in emissions reductions from applying 400,000 tons of compost to land. It is assumed this can be fully implemented in 2026 and each year through 2050. NJ has well over 20,000 acres of land in agricultural production.

6. Highly Warming Climate Pollutants Chapter Measures' GHG Emissions Reductions Calculations

This chapter includes measures related to the subsectors of natural gas transmission and distribution (T&D), halogenated gases, and black carbon.

GHG Reduction Measures by Subsectors:

Methane from Natural Gas (NG) Transmission and Distribution

It is worthwhile noting that the 2024 EMP modeling does not account for 2025 updated data from the Pipeline and Hazardous Materials Safety Administration (PHMSA), particularly regarding the number of LNG compressor stations. In 2021, the 2024 EMP model assumes there is one station, but updated data shows that there are 6 stations. As a result, emissions are 0.2 MMT CO₂e lower in the 2024 EMP model. As such, we modify the 2025 PHMSA database to reflect the 2024 EMP modeling for consistency across measures.

NG-6.1 Implement a mandatory emissions reduction program for natural gas T&D systems

The emissions cap was modeled to match the emissions trajectory in the CCAP Scenario output. Specifically, the 2024 EMP demand management projection for natural gas T&D emissions will equate to 1.8 MMT CO₂e in 2050, which was used to estimate the annual percent reduction from 2022 BAU emissions (2.5 MMT CO₂e) to achieve the emission reduction goal. As a result, emission reductions will be capped at 8% in 2030, 17% in 2040, and 29% in 2050 relative to 2022 emissions. By subtracting the Current Policy Scenario from the outcome of this CCAP Policy Scenario, the emissions benefit from introducing the emissions cap beyond what is expected under current policy was retrieved.

NG-6.2 Stop the expansion of natural gas T&D infrastructure and introduce non-pipeline alternatives.

This measure assumes that natural gas utilities discontinue the build-out of distribution infrastructure beginning in 2030 and undergoes retirements of old distribution mains and service lines using historical rate changes by materials from 2012-2022 (PHMSA, 2025). From 2023-2029, the modeling assumes 644.4 miles of plastic main distribution pipelines and 42,712.3 plastic service lines are added each year. From 2023-2050, protected steel main pipelines decrease by 70.8 miles, unprotected steel main pipelines decrease by 157.3 miles, cast/wrought iron pipelines decrease by 215.5 miles, and the number of protected steel services lines decrease by 12,569.8 and unprotected steel services lines decrease by 20,179.6 each year. Further, it is assumed there is one LNG compressor station, to accurately compare results to the 2024 EMP output. The emissions benefit of this measure was estimated using the EPA State Inventory Tool, version 2025.1 (USEPA, 2025c), with the following emissions factors (metric tons of methane gas per year mile of pipeline) for each distribution pipeline material: 5.80 for cast iron, 2.12 for unprotected steel, 0.06 for protected steel, and 0.37 for plastic. Emissions projected from stopping the growth of natural gas T&D

infrastructure under this measure are subtracted from emissions under the Current Policy scenario to estimate the emissions reduction benefit.

Halogenated Gases (HFCs)

HFCs-6.1 Implement a refrigerant management program

The GHG emissions benefits of this measure, which is focused on reducing GHG emissions from the refrigeration sector, were calculated based on the estimate of 44% reductions in refrigerant leakage from the EPA GreenChill partnership program (USEPA, 2025e). Also taken into account were the estimated 49.7% reductions in refrigerant leakage from the Weis supermarkets' programs (Weis Markets, 2024). The more conservative figure, the 44% reduction, was applied to the total emissions from the refrigeration sector from New Jersey's 2022 inventory to determine the remaining emissions after the implementation of the program. This scaled refrigerant sector emissions quantity was then used for the "refrigeration" sector category of the 2022 inventory, and it was added to the existing estimated emissions from the rest of the sectors of halogenated gas usage in the inventory, e.g., air conditioning, foams, and propellants. Using this method, it was determined that the total reduction across sectors from this refrigerant management program by 2050 would be 16%, or 0.81 MMT CO₂e. This total reduction was divided across the years of the program, 2022 to 2050, with reductions starting with the program's initiation in 2030 and tapering off starting in 2040.

HFCs-6.2 Implement a refrigerant replacement incentive program

The GHG benefits of this measure, which is focused on reducing GHG emissions from the refrigeration sector, were calculated based on an analysis of the 2023 GHGMRR facility reports, particularly the installation date of the facilities' refrigeration or chiller equipment as a proxy for the age of the equipment. Total emissions of refrigerants in valid 2023 reports were 0.463 MMT CO₂e. The 2023 data reports were filtered for equipment over the age of 15 years. The emissions from the actual refrigerants used in those pieces of equipment (GWP100) were calculated and compared to the refrigerant emissions from those pieces of equipment with an assumed cap of 150 for the GWP100, if this program were implemented. The emissions reduction from applying this program to all of the equipment over 15 years of age would yield a 94% GHG emissions reduction just from this older equipment.

Since it is unlikely that the State incentive program would provide funding to replace all of this high-GWP refrigerant equipment that is over 15 years old with equipment using lower GWP refrigerants, the analysis assessed the GHG emissions reduction benefits of this program if it were applied to just 20% of the equipment over 15 years of age. The 94% emissions reduction was scaled to just 20% of the equipment, resulting in a 18.82% emissions reduction, or a 0.0439 emissions reduction from implementing this program across the 2023 GHGMRR reports.

This emissions reduction was then applied to the total emissions from the refrigeration sector from New Jersey's 2022 inventory to determine the remaining emissions after the implementation of the program. This scaled refrigerant sector emissions quantity was then added to the rest of the sources of the halogenated gases in the inventory, e.g., air conditioning, foams, and propellants, to determine that the total reduction across all sectors from this program by 2050 would be a 3.47% reduction or 0.173 MMT CO₂e. This total emissions reduction was divided across the years of program implementation, 2022 to 2050, with reductions starting in 2030 and tapering off starting in 2040.

Black Carbon

While there are not specific measures outlined for the black carbon sector, several measures in other chapters of the CCAP would help to reduce black carbon. See the other sector chapters of this document for information on how these measures were quantified.

- Emissions Reduction Transportation Chapter Measure 1: Continue to implement all current policies and expand current transportation electrification programs
- Emissions Reduction Commercial & Residential Buildings Chapter Measure 4: Establish all-electric building codes
- Emissions Reduction Industry Chapter Measure 1: Adopt manufacturing equipment efficiency standards and incentives for energy efficient technologies.
- Emissions Reduction Industry Chapter Measure 2: Implement a mandatory emissions reduction program for high-emitting sources in the industry sector.
- Emissions Reduction Waste & Agriculture Chapter Measure 1: Adopt stricter rules and incentives for monitoring emissions, landfill caps, and odor controls at landfills and wastewater treatment facilities
- Emissions Reduction Natural Working Lands – Carbon Sequestration Chapter Measure 2: Protect, maintain, and avoid the conversion of natural lands, including 21,000 acres of forested lands, through high-carbon land acquisitions and policies that promote location-efficient development.

7. Natural and Working Lands - Carbon Sequestration Measure GHG Emissions Reductions Calculations

GHG Reduction Measures:

7.1 Strengthen and expand existing natural carbon sinks through reforestation, afforestation, and restoration, to at least 10 MMT CO₂e/year

NJDEP estimated the carbon that would be sequestered from implementation of the following enabling actions that are part of this measure:

- 1.1 Afforestation of at least 4,000 acres by 2050
- 1.3 Plant 1,000,000 street or shade trees by 2050
- 1.5 Plant cover crops on 40,300 acres of pasture lands by 2050
- 1.6 Increase cover of salt marsh vegetation by at least 3,000 acres by 2050
- 1.7 Install at least 202,000 linear feet of living shorelines by 2050

The approximate, cumulative carbon sequestration benefits by 2050 of each these actions were summed to generate an estimate of the total CO₂e sequestered by 2050 from the measure. The estimate does not consider the GHG impacts of enabling actions 1.2, 1.4, 1.8, 1.9 or 1.10 as there was not enough information available to generate estimates for these aspects of the measure.

The Greenhouse Gas Management Institute (GHGMI) developed estimates of the additional carbon sequestration that the State could realize through implementation of action 1.1; 1.5 and 1.6, using NJ 2020 LULC dataset (NJDEP, 2024b), and preliminary model and calculations from the updated natural carbon sink methodology they are developing for New Jersey.

Afforestation of at least 4,000 acres by 2050

GHGMI generated annual estimates of carbon flux from land converted to forest in action 1.1 using the following assumptions:

- Trees planted following a linear extrapolation trend: 320 acres planted between 2026 and 2030 each year, and 120 acres planted between 2031 and 2050.
- Pre-transition land use: Afforestation is accomplished on abandoned agricultural fields. NJ LULC class "Old Field" was used to simulate this, which is included under grassland land category.

- Biomass C: When land is converted from grassland to forest, it is assumed that pre-transition biomass C stock remains and biomass from newly planted trees occurs (could lead to a slight overestimation of biomass C).
- Post-transition forest characteristics: Deciduous forest, 10-50% crown cover, mineral soils.
- Soil C: Soil flux is 0 since old fields are assumed to be similar to natural soil conditions and in equilibrium and not like cultivated soils (could lead to a slight short term undercounting of emissions due to soil disturbance associated with site preparation for planting).
- Biomass C: Biomass C accumulation in newly planted trees is accounted in the category "land converted to forest" for the first 20 years, where trees are assumed to grow at a faster rate. IPCC default accumulation rate (same for all forest types, 0.588 tonnes C/acre/year). After 20 years, they are accounted for under the "forest remaining forest" category. Accumulation rate was derived from NJ FIA data (0.3 tonnes C/acre/year). Biomass C accumulation continues past 2050, but is not captured in these results - trees planted between 2031 and 2050 grow in the "land converted to forest" category incrementally transitioning to "forest remaining forest" starting in 2051 and then continue to grow but at a slower rate.

The annual carbon flux estimates total -0.14 MMT CO₂e in cumulative carbon sequestration by 2050 for enabling action 1.1

Planting 1,000,000 street/shade trees by 2050

NJDEP generated estimates for the carbon sequestered from enabling action 1.3 scaling up the carbon sequestration estimates generated for the near-term action "Plant 250,000 street/shade trees by 2030" from NJ's Priority Climate Action Plan (PCAP) (NJDEP, 2024). This prior NJDEP estimate used i-Tree planting calculator tool (U.S. Forest Service, 2025). Estimates were generated using the tool by inputting a group of 41,667 trees² using a project lifetime equal to the number of years until 2030 and 2050 for each year of the project. Lifetime inputs assumed that trees planted in 2024 would sequester carbon for 6 years and 26 years until 2030 and 2050 respectively, whereas trees planted in 2025 would sequester carbon for 5 years and 25 years respectively, and so on for the different runs of the i-Tree planting calculator tool. All input assumptions were the same for all runs of the tool except for the lifetime years. Tree species input were standard for all runs of the i-tree planting calculator and assumed trees planted would be no more than 10% of the same species of tree and 30% of the species would be smaller street tree species (10'-12') while 70% larger species (12'-14'). The tree species used in the iTree calculation were: 10% red maple, 10% American hornbeam, 10% common hackberry, 10% eastern red bud, 10% black gum, 10% Kentucky coffeetree, 10% black cherry, 10% northern red maple, 10% littleleaf linden, and 10% American sycamore. All trees were assumed to be planted with a diameter at breast height (DBH) of 2.5; be in excellent condition; be planted with 50% of trees in full exposure to sun and 50% of trees in partial exposure. Location inputs are required when using the i-Tree planting calculator tool. All calculations assumed trees were planted in Trenton, in Mercer County, NJ. All calculations assumed a 90% survival rate of trees by 2030 and 50% survival rate by 2050. This estimate is based on Hilbert et. al mortality rate data for urban tree plantings (Urban Tree Mortality: A Literature Review, 2019), assuming an average of 2.45% mortality per year, which at 25 years approaches 50%. Sequestration estimates by 2030 and 2050 from each of the 6 years of planting trees by 2030 were then summed for a total estimate of 9,003 metric tons of CO₂ equivalent emissions sequestered by the enabling action by 2030 and 129,384 metric tons of CO₂ equivalent by 2050.

To estimate the carbon sequestration potential by 2050 of planting 1,000,000 street/shade trees NJDEP multiplied Y1 planted trees (41,667) and the corresponding total CO₂e sequestered by 2050 from trees planted in that year by 4. This generates an estimate of roughly 0.283 MMT CO₂e sequestered by 2050 from planting 1,000,000 trees. This

² This value was rounded down to 41,666 trees for the last three planting years to equal a total of 250,000 trees.

is a more aggressive planting scenario –(meaning most of the trees in action are planted in the near term) that achieves a greater amount of sequestration. Note however, that this may be an overestimation of the carbon that would be sequestered from this measure, since it assumes that the million trees would all be planted over the next 5-6 years. In reality it may be that the rate of street tree planting will continue at a rate closer to a linear rate until 2050. If the State were to begin planting the 1M street/shade trees in 2026, planting 41,667 trees per year, until the year 2050, the total carbon sequestered from those trees would be about 0.138 MMT CO₂e. This assumes that the carbon sequestered from trees planted each subsequent year from the initial planting year decreases exponentially from 12,215 MT CO₂e from those planted in the year 1 to 2,041 MT CO₂e from trees planted in year 24. This estimate does not account for the carbon sequestered from trees that have already been planted in 2024 and 2025 that could be considered part of the 1,000,000-tree target set by NJ's Natural and Working Lands Strategy in 2024. The timing of planting makes the biggest difference with terrestrial sequestration since carbon sequestered from trees does not occur at a linear rate. NJDEP chose to use the more aggressive planting scenario estimate in the CCAP because that may be closer to how implementation of the action is approached – in other words most of the tree plantings will occur in the near to mid-term.

Plant cover crops on 40,300 acres of pasture lands by 2050

The estimate for CO₂e sequestered from enabling action 1.5 by 2050 was also prepared by GHGMI. Annual estimates of carbon flux from increases to soil carbon (-2,410.81 MT CO₂e/yr) were generated using the following assumptions:

- Adoption of cover crops follows a linear extrapolation trend: if the State starts out with 40,300 acres of row crops without cover crops in 2025, 1,612 acres get converted to row crops with cover crops each year, and by 2050, all 40,300 acres have cover crops.
- Pre-transition cropping system: Annual row crops: long term cultivation, medium inputs, tillage proportional to current situation (46% no till, 29% reduced till, and 25% conventional till). Note this is a potential underestimation as cover cropping practices may be coupled for higher no-till rates as well increasing capture of carbon by soil.
- Biomass C was not estimated, assumed to be stable, i.e. no flux.
- Post-transition cropping system: Annual row crops with cover crops: long term cultivation, high inputs, tillage proportional to current situation (46% no till, 29% reduced till, and 25% conventional till)
- Soil C: Stock change year to year is indicative of soil C flux, assumed transition occurs instantaneously, however likely takes ~20 years to reach a new equilibrium, therefore likely an overestimation in the short term. However because data on 20 year transitions are not tracked, the calculator assumed simply that all carbon is sequestered in the year of transition.

The total cumulative CO₂e sequestered for action 1.5, [-0.06 MMT CO₂e] represents the sum of annual reductions from 2026-2050.

Increase cover of salt marsh vegetation by at least 3,000 acres by 2050

The estimate for CO₂e sequestered from enabling action 1.6 by 2050 was also prepared by GHGMI. Annual estimates of carbon flux from increasing salt marsh vegetation cover were generated by taking the sum of annual CO₂e sequestered from land conversion to wetlands and the annual methane (CH₄) emissions released in CO₂e. The total cumulative reductions for action 1.6 [-0.04 MMT CO₂e] represent the sum of net annual reductions from 2026-2050. Estimates were generated using the following assumptions:

- Restoration rate: Marsh restoration following a linear extrapolation trend: 120 acres restored every year between 2026 and 2050 each year

- Pre-transition land use: NJ LULC class "Old Field" was used to simulate this, which is included under grassland land category
- Post-transition marsh class: Saline Marsh, there are two saline marsh classes in the NJ LULC dataset, high saline marsh and low saline marsh, but the since emission factors to differentiate these were not available, the same emissions factor was used regardless of which one was selected.
- Soil C: It is assumed that soil accumulation occurs at the annual rate (0.42 MT C/ac/yr)
- Biomass C: When land is converted from grassland to a wetland, it was assumed that pre-transition biomass C stock is lost and biomass from newly restored marsh appears in the year of transition.
- Methane: Methane emission estimates are included, emission factor based on salinity. Methane's GWP₁₀₀ value of 28 was used, as per 2014 IPCC Fifth Assessment Report GWP values for non-fossil methane relative to CO₂ (IPCC, 2013).

Install at least 202,000 linear feet of living shorelines by 2050

The 202,000 linear ft by 2050 figure was generated from the NJ Natural and Working Land Strategy (NWLS) Target (WL4) which states that New Jersey aims to reach a living shoreline installation rate of 7,800 ft/year by 2030 and then increase that rate to 10,000 ft/yr by 2050 (NJDEP & NJDA, 2024). Assuming installation begins in 2026 and increases at a linear rate of ft/year until reaching 7,800 in 2030 and then up to 10,000 by 2050 produces a sum total target of 202,500 ft of installed living shorelines by 2050. This figure was rounded to 202,000.

NJDEP generated estimates for the carbon sequestered from enabling action 1.3 scaling up the carbon sequestration estimates generated for the near-term action "Install 7,800 linear feet of living shoreline per year by 2030" from NJ's PCAP, which based its 2030 carbon sequestration estimate on data from NJDEP NCS program projects currently underway (NJDEP, 2024).³ This method generated an approximate rate of 0.738 MT CO₂e/ft/yr sequestration per foot of living shorelines by 2050. NCS projects currently underway are set to install 32,318 ft of living shoreline. This leaves 169,682 ft left to install to reach the 2050 goal. $169,682 \text{ ft} \times 0.738 \text{ MT CO}_2\text{e/ft/yr} = 125,265 \text{ MT CO}_2\text{e}$ sequestered by 2050. This total was combined with the cumulative CO₂e sequestered from the currently underway NCS living shorelines projects (23,858 MT CO₂e) to arrive at a total of 149,123 MT CO₂e in cumulative GHG emissions sequestered by 2050 from installation of 202,000 linear ft of living shorelines. This rough estimate relies on the approximate rate of carbon sequestered per ft/yr, which is derived from existing living shoreline project estimates. This rate is limited in that it assumes that the additional required feet of living shoreline would all be planted in the near term, unlike the NWLS target which includes annual installation rates likely spread across the 24-year time period. In reality, living shoreline installation may not follow a linear annual rate, and may instead be installed in large amounts every several years as projects are completed. This could be at pace or below the pace of the NWLS target rates. This depends on the size of the projects and the number of living shorelines projects that receive funding. For instance, as the first round of NCS projects are set to be completed in the next four-five years, the state is already on track to surpass the target cumulative installed feet for 2030 (which is 23,400 ft assuming a linear increase from 0 up to the 7,800 ft/yr). Additionally factoring in the second round of NCS funding and other NJDEP wetland and research projects that also create living shorelines, it's possible the State could see cumulative living shorelines installation that outpaces the target rates in the near term. However, uncertainties exist around the funding for installation in the long term. For simplicity of this estimation exercise and considering the uncertainty around the future rates of installation, NJDEP assumed the more aggressive installation scenario, which would provide the greatest sequestration benefit. As a result, NJDEP estimates that the total cumulative CO₂e sequestered for action 1.7 by 2050 would be -0.15 MMT CO₂e.

³ See [NJPCAP Appendix 7.2 page 114](#) for more details on method and assumptions used to estimate carbon sequestration potential of NCS living shorelines projects.

7.2 Protect, maintain, and avoid the conversion of natural lands, including 21,000 acres of forested lands, through high-carbon land acquisitions and policies that promote location-efficient development

Using the estimates from forest inventory and analysis data cited in the NWLS, DEP estimates that avoiding the conversion of approximately 21,000 acres of forested lands to non-forested uses could avoid roughly 7.7 MMT of CO₂e emissions and sequester an additional total of 308,000 metric tons of CO₂e by 2050.

These estimates assume the annual rate of converted acres is held constant at the current rate of 4,000 acres lost/year until 2030 at which point NJ begins avoiding conversion at a linear annual rate to reach the target rate of 2,000 acres/yr in 2050.

The estimate relies on the Forest Inventory and Analysis data figures that each acre of forest in NJ on average stores about 370 metric tons of CO₂e and sequesters about 2 metric tons of CO₂e per year (NJDEP & NJDA, 2024). While this estimate assumed that all the carbon stored in forests would be released when cleared for development, it should be noted that it is likely that at least some of a forest cleared for development will be harvested for timber and turned into wood products, which would continue to store a portion of that carbon instead of releasing it into the atmosphere as CO₂. Taking this into consideration would reduce the total carbon emissions avoided from this measure.

Alternatively, this estimate does not take into account any of the additional benefit from avoiding the GHGs emitted from more energy intensive and higher-emitting land uses such as from car-dependent, commercial or residential development that could take the place of forest lands. The estimate only quantifies the potential benefit of avoiding conversion of forested lands. The additional GHG impacts and/or benefits from avoiding the conversion of tidal wetlands, agricultural lands and aquatic resources were also not factored into this estimate due to data limitations, but DEP can expect conservation of these NWL resource types will reduce and sequester additional GHGs.

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APPENDIX D

COMMUNITY BENEFITS ANALYSIS REPORT



Community Benefits Analysis of CCAP

Executive Summary

A team at Rutgers, the State University of New Jersey's Bloustein School of Planning and Public Policy conducted the community benefits analysis regarding the New Jersey GHG reduction measures in the Comprehensive Climate Action Plan (CCAP). This analysis highlights the benefits associated with New Jersey's GHG reduction measures through the impacts of reduced GHG emissions and co-pollutant emissions (*e.g.*, PM_{2.5}, NO_x and NO₂, SO₂, VOCs, air toxics) ([Section 2](#) and [Section 3](#)). GHG reduction measures in New Jersey will have a positive impact on human health as well as other co-benefits including increased resilience and enhanced climate adaptation, greater access to climate smart transportation alternatives, improved housing quality (*e.g.*, energy efficiency), enhanced community green space, decreased energy costs and increased energy security, workforce development opportunities, and improved quality of life (*e.g.*, noise reduction). In some cases, implementation of these GHG reduction measures may create disbenefits within New Jersey communities: this community benefits analysis brings these unintentional disbenefits to the fore and includes recommendations regarding how to overcome and/or mitigate these disbenefits.

The search to identify benefits, disbenefits, and considerations to avoid disbenefits when implementing GHG reduction measures focused on the impact the eight different sectors of GHG reduction measures would likely have on various outcomes. These outcomes include public health (including physical and mental health outcomes), access to smart transportation alternatives, housing quality, access to greenspaces, energy costs, workforce development opportunities, and the overall resilience of New Jersey's population to climate change. Of note is that OBC and AIOBC are often disproportionately impacted by environmental stressors (*e.g.*, flood events, temperature extremes, pollution) because these communities tend to live in areas that are more vulnerable to the environmental stressors, and these communities have been subject to historic inequities that hinder their ability to adapt to said stressors.

This community benefits analysis builds on the research and community engagement conducted by Rutgers University for the 2024 Priority Climate Action Plan's (PCAP) Benefits Analysis ([Herb et al. 2024](#)). This included stakeholder feedback collected between September and December 2023 during which stakeholders provided feedback on the 2024 priority measures.

This 2025 Community Benefits Analysis for New Jersey's CCAP consisted of three primary tasks:

- **Literature Review:** A literature review was conducted to identify likely outcomes and impacts of the GHG reduction measures to the full population of New Jersey, including both primary impacts and coincidental/indirect impacts. The literature review expanded on the literature review conducted for the 2024 PCAP. This literature review yielded over 750 possible sources (including guidance documents and peer reviewed articles) which were narrowed down based on a review of the abstracts of each resource for relevance.
- **COBRA Quantitative Analysis:** EPA's CO-Benefits Risk Assessment Health Impacts Screening and Mapping Tool was used to quantify the impacts of New Jersey's GHG reduction measures. Analysis was conducted by E3, Inc., and follow up analysis was conducted by Rutgers and NJDEP and summarized here. The outputs of the quantitative analysis include: a base-year inventory of co-pollutant emissions statewide; anticipated projected future co-pollutant emissions with and without GHG reduction measures for the years 2035 and 2050 statewide; quantified and monetized health benefits associated with this decrease in co-pollutants for the years 2035 and 2050 by county; and the monetary cost and annual mortality associated with select measures for the years 2035 and 2050, statewide.
- **Stakeholder Engagement:** Stakeholder feedback on the CCAP climate mitigation and pollution issues was collected in April and June 2025 and has been integrated into this analysis. Stakeholders provided input through several meetings. One in-person community listening session was held co-hosted by the NJ NAACP's Metuchen Edison and Piscataway Branch (MEAB) and the Southern Burlington County NAACP. Three virtual stakeholder engagement sessions were co-hosted by: Tyrese Gould Jacinto (Former Vice-Chair of the NJ Environmental

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Justice Advisory Council; President and CEO of Native American Advancement Corp. (NAAC); Member of the Nanticoke Lenni-Lenape Nation); Marcus Sibley (Environmental & Climate Justice Chairman for the Southern Burlington County NAACP; Chairman of NJ Progressive Equitable Energy Coalition (NJPEEC)); and Helaine Barr, Assistant Director of Climate Change, Clean Energy and Sustainability at NJDEP.

In regard to the quantitative analysis findings, Table ES.1 and ES.2 below provide an overview of the in-depth analyses conducted in [Section 2](#) and [Section 3](#) of this report.

- Table ES.1 summarizes the annual total benefits avoided co-pollutant emissions from the GHG reduction measures in the CCAP Scenario for the years 2035 and 2050.
- Table ES.2 summarizes the anticipated economic benefits associated with the total co-pollutant emissions benefits to the full population of New Jersey. In 2035, the state will save approximately \$777 million by implementing the CP Scenario and will save approximately \$1.2 billion by implementing the GHG reduction measures consistent with the CCAP Scenario. These monetary savings increase in 2050 when the state will save approximately \$2.0 billion by implementing the CP Scenario and will save approximately \$3.6 billion by implementing the GHG reduction measures consistent with the CCAP Scenario.

Table ES.1. Co-pollutant emissions in New Jersey (short tons). This includes the National Emissions Inventory baseline in 2020 through the BAU, CP and CCAP scenarios of 2035 and 2050. Overall emissions of nitrogen oxides drop from 87,642 short tons in 2020 to 44,629 short tons in 2050, with the full implementation of the CCAP scenario. Volatile organic compounds drop from 122,816 to 94,679 short tons.

Co-Pollutant	NEI 2020	BAU 2035	BAU 2050	CP 2035	CP 2050	CCAP 2035	CCAP 2050
Nitrogen Oxides	87,642	84,915	85,796	75,821	63,103	69,803	44,629
Sulfur Dioxide	2,670	2,753	2,954	2,644	2,711	2,588	2,525
Ammonia	8,219	7,681	7,644	6,906	5,610	6,732	4,733
PM _{2.5} Primary (Filt + Cond)	25,836	25,901	26,313	25,376	24,917	25,091	23,779
Volatile Organic Compounds	122,816	115,532	114,083	109,066	98,385	108,061	94,679

Table ES.2. Total monetized benefits of all measured health outcomes for all 21 counties in New Jersey annually in 2035 and 2050 for each scenario. Values in millions of dollars (2024 USD).

Year	Current Policy Scenario	Additional Benefits of the CCAP Scenario	Total Benefits of the CCAP Scenario
2035	777.66	453.17	1,230.83
2050	1,999.43	1,588.96	3,588.39

In regard to the qualitative analysis, Rutgers identified three cross-cutting insights that are relevant to any of the CCAP measures and may enhance the positive impact the enabling actions will have on all New Jersey communities, including overburdened communities (OBC) and adversely impacted overburdened communities (AIOBC), [as defined in New Jersey](#). These opportunities are listed below:

- Siting more energy-saving and pollution-reducing infrastructure in or near OBC and AIOBC communities would help to mitigate the disproportionate impacts to (and vulnerabilities of) these populations to greenhouse gas pollution and co-pollutants. This includes distributed solar, heat pumps, food waste diversion programs, and restoration and preservation efforts of natural and working lands, to name a few.
- Long-term planning with OBC and AIOBC will be essential to avoiding unintended disbenefits from implementing CCAP measures. Enabling actions may offer short-term benefits to OBC and AIOBC (e.g., community beautification, energy savings, increased resilience) but renters/homeowners in economically vulnerable communities may be at risk of future displacement due to the increase in value of their home.
- The following are important for ensuring OBC and AIOBC know (1) what CPRG programs they have access to, (2) the benefits of engaging in the enabling actions, and (3) available resources for the enabling actions:
 - Sustained funding
 - Proactive technical assistance
 - Proactive outreach to communities about funding opportunities, technical assistance opportunities, energy-saving and pollution-reducing infrastructure, and long-term planning.

Below is a summary of the GHG reduction measures' qualitative impact to New Jersey communities (Table ES.3). The table provides an overview of the benefits and disbenefits associated with each measure, and it assigns each GHG reduction measure with a low, medium, and high ranking where "high" indicates a measure with a high positive impact on the full population of New Jersey. A high ranking was generally assigned to measures with (1) broad benefits that are also necessary to build infrastructure that could support other measures and/or (2) implications to a large percentage of

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the population in New Jersey (*i.e.*, had impacts over a wide geographic area or had impacts to more than one group of people).

Table ES.3. Summary table of the impacts, benefits, and disbenefits associated with the eight sectors. Each respective GHG Reduction Measure Ranking indicates the level of positive impact a measure may have on the full population of New Jersey. Each measure below is dependent on the implementation of enabling actions to achieve the measure.

	GHG Reduction Measure	Summary of Impacts	Impact Ranking for Full Population
Electric Generation and Demand Sector			
1	Codify the 100% Clean Electricity Standard	+ Physical health/improved air quality + Increased resilience + Improved Energy Security + Workforce Development - Physical health/improperly recycling batteries - Household expense of implementing measure.	High – This measure ensures 100% of retail electricity sales will be met by generation from zero-carbon resources which has positive impacts for all populations in New Jersey.
2	Reduce peak demand through adoption of progressive electricity rate designs and flexible loads	+ Physical health/improved air quality - Unequal Distribution of Environmental Benefits - Mental Health issues	High – This measure would require EV off-peak charge management and building heat pump usage, installing smart meters, smart thermostats, and implementing virtual power plants (VPP) to coordinate connected resources.
3	Support the development of 9GW of distributed solar and 19.6 GW of utility scale solar by 2050	+ Physical health/improved air quality + Workforce Development + Mental Health + Improved Energy Security - Physical health/unsustainable manufacturing and transport of materials - Community beautification - Decreased financial security - Non-accessible programing	High - This measure would increase the amount of solar energy accessible to industry (via the Competitive Solar Incentive program and Dual Use Solar program), state and local government facilities, and residential communities.
4	Continue to participate in RGGI program.	+ Physical health/improved air quality + Workforce Development + Mental Health + Improved Energy Security - Physical health/unsustainable manufacturing and transport of materials - Community beautification - Decreased financial security - Non-accessible programing	High – This measure would follow the Strategic Funding Plans which identifies how the Regional Greenhouse Gas Initiative (RGGI) auction proceeds will be distributed among the NJDEP, NJ Board of Public Utilities, and the NJ Economic Development Authority.
5	Continue to support the development of 11GW of offshore wind by 2040	+ Physical health/improved air quality + Workforce Development + Mental Health + Improved Energy Security - Physical health/unsustainable manufacturing and transport of materials - Community beautification - Decreased financial security - Non-accessible programing	High – This measure would add 11GW of offshore wind power generation by 2040.
6	Support the development of 2GW of new nuclear energy generation sources by 2050.	+ Physical health/improved air quality + Workforce Development + Improved Community Financial Security + Improved National Security - Physical health/improperly managed nuclear material and waste - Land Use	High – This measure would add at least 2GW of new nuclear power generation by 2040. This may take the form of small modular nuclear reactors or additional reactors with generation capacity similar to existing units.
7	Support the deployment of 22 GW of battery storage by 2050.	+ Physical health/improved air quality + Increased resilience + Improved Energy Security + Workforce Development - Physical health/improperly recycling batteries	High – This measure would add at least 22GW of battery storage capacity by 2040 - NJ can accomplish this through continuation and expansion of existing storage incentives as well as pursuing

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	GHG Reduction Measure	Summary of Impacts	Impact Ranking for Full Population
		- Household expense of implementing measure.	investments in new grid-scale battery storage.
8	Invest in the development of 7GW of additional clean firm capacity (beyond what is listed above)	+ Physical health/improved air quality and reduced noise pollution + Workforce Development - Physical health/improper transport or use of materials - Economic stress	High – This measure would add 7GW of clean energy through a combination of technologies such as - long duration battery storage; new nuclear; hydrogen utilization in fuel cells; hydrogen or renewable natural gas utilization in combustion-based resources (e.g. combustion turbines, CTs, or combined cycle gas turbines, CCGTs); and other technologies,
Transportation Sector			
1	Implement a GHG reduction planning standard for state and Metropolitan Planning Organization (MPO) transportation plans to reduce statewide light-duty vehicle miles travelled (VMT) 3% by 2050.	+ Physical health/improved air quality + Mental Health + Workforce Development - Physical health/pedestrians near streets, poor air quality and accident risk - Inequity in eMobility access and resources	High - This measure would require state and MPO transportation plans to assess and mitigate their GHG emissions impact to reach GHG reduction targets, including VMT, by a near-term target year. It advances public transit, telework, bike and pedestrian infrastructure; transit-oriented development; and more.
2	Implement large-scale public transit projects to reduce statewide light-duty VMT	+ Physical health/improved air quality + Mental Health + Workforce Development - Physical health/pedestrians near streets, poor air quality and accident risk - Inequity in eMobility access and resources	High - This measure would fund all levels of planning and implementation of large-scale transit projects to transfer the largest numbers of trips from driving to transit by connecting residential hubs with commercial and recreational hubs across the state. Include projects such as The Secaucus Meadowlands Transitway and South Jersey Bus Rapid Transit (BRT). Implement last-mile solutions to transit hubs.
3	Explore new pricing and other transportation alternatives that reduce VMT and emissions	+ Physical health/improved air quality + Mental Health + Workforce Development - Physical health/pedestrians near streets, poor air quality and accident risk - Inequity in eMobility access and resources	High – This measure would develop and implement alternative for gas tax, such as distance-based user fees, VMT fees, etc. and other travel demand management which may include congestion pricing, parking cash-out (PCO) and car-free tax incentives.
4	Implement all current policies and expand current transportation electrification programs.	+ Physical health/improved air quality + Mental Health + Public Safety + Workforce Development + Increased financial security + housing quality + climate resilience + energy security + noise reduction - Physical health/pedestrian injury - Financial uncertainty	High – This measure would ensure NJ continues Advanced Clean Cars Program (ACC) implementation and incentivize rapid, widespread adoption of electric vehicles throughout the state. While the future of the Advanced Clean Cars 2 (ACCII) and Advanced Clean Trucks (ACT) programs are uncertain, New Jersey must maintain its commitments made under the EV Law and the Medium- and Heavy-Duty Memorandum of Understanding. These commitments work to support New Jersey's momentum towards the outcomes projected under ACCII and ACT.
Residential and Commercial Buildings Sector			
1	Accelerate heat pump installations	+ Physical health/improved air quality + Financial Security + Workforce Development - Physical health/air pollution	High – This measure would expand and modify NJ incentive structure to prioritize adoption of heat pumps in residential and commercial buildings.

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	GHG Reduction Measure	Summary of Impacts	Impact Ranking for Full Population
		- Quality of life (noise pollution, expense)	Revise rate structures to align with increased electrification from heat pump adoptions
2	Adopt a Clean Heat Standard	+ Physical health/improved air quality + Mental Health + Improved Energy Security - Physical health/air pollution - Quality of life (noise pollution, expense, overpromised benefits)	Medium – This measure would require gas and delivered fuel utilities to reduce the emissions associated with the heating fuel they supply.
3	Upgrade building envelopes	+ Physical health/improved air quality + Mental Health + Improved Energy Security - Physical health/air pollution - Quality of life (noise pollution, expense, overpromised benefits)	High – This measure would implement various policies to retrofit 59% of existing residential and 72% of commercial buildings by 2050 and make 10% of low-to-moderate income properties electrification-ready.
4	Establish all-electric building codes	+ Physical health/improved air quality + Mental Health + Improved Energy Security - Physical health/air pollution - Quality of life (noise pollution, expense, overpromised benefits)	High – This measure would enact an all-electric building code that requires newly constructed buildings to have all-electric and energy efficient appliances and equipment that utilize either on-site or off-site renewable energy as its leading electricity source.
5	Adopt statewide Building Performance Standards	+ Physical health/improved air quality + Mental Health + Financial Security + Increased safety - Human Health - Increased Costs	Medium – This measure would, as an extension to the State's existing benchmarking program, update building performance standards to set energy efficiency standards for large commercial buildings greater than 25,000 square feet.
6	Adopt Zero Emissions Standards for space and water heating	+ Physical health/improved air quality + Mental Health + Financial Security + Increased safety - Human Health - Increased Costs	Medium – This measure would require manufacturers and contractors for residential and commercial buildings to meet emission standards for newly installed furnaces, boilers, and water heaters.
7	Lead by example by decarbonizing State, county and municipal resources	+ Physical health/improved air quality + Mental health + Financial Security + Improved Energy Security + Workforce Development - Physical health/air pollution - Quality of life (noise pollution, expense)	Medium – The measure would require all State government buildings to perform energy audits and implement energy efficiency and electrification measures to reduce their building's emissions.
Industry Sector			
1	Adopt manufacturing equipment efficiency standards and incentives for energy efficient technologies in manufacturing	+ Physical health/improved air quality + Reduced Energy Costs + Improved Housing Quality + Financial Security + Workforce Development - Environmental Health - Physical Health (exposure to improperly handled materials) - Reliability of Industrial Heat Pumps - Quality of Life (noise pollution, expense)	Medium - This measure would require manufacturers of new industrial furnaces and water heaters used in manufacturing to meet energy efficiency standards. Incentives would support installation of industrial heat pumps, thermal batteries, and other energy efficient technologies.
2	Implement a mandatory emissions reduction program for high-emitting sources in the industrial sector.	+ Physical health/improved air quality + Improved Environmental Health - Decreased services - Increased noise pollution	High – This measure would set a declining cap on emissions from sources that emit 24,000 MT/year or greater, to reduce emissions a specific percentage (25%) below baseline levels by 2050.
Waste and Agriculture Sector			
1	Adopt stricter rules for landfill caps and lower threshold for emission reporting and controls at landfills and	+ Physical health/improved air quality - Safety Risks - Technology Lock-in	High – This measure would modify GHG Monitoring and Reporting (GHGMR) rule to expand controls on methane emissions from landfills and wastewater and explore using remote

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	GHG Reduction Measure	Summary of Impacts	Impact Ranking for Full Population
	wastewater treatment facilities (WWTFs).		sensing technology to detect leaks and enforce compliance.
2	Expand regulatory requirements for food waste recycling and diversion	+ Physical health/improved air, soil, and water quality + Mental Health - Emissions - Physical Health (exposure to improperly handled materials) - Mental Health - Financial Resilience - Capacity to store food	Medium – This measure would expand requirements such as lowering the current food waste recycling regulatory threshold for large generators from 52 to 25 tons and requiring all food waste generating businesses in the state to reduce or divert some percentage of their annual food waste through a combination of reduction, donation, composting or sending to recycling facilities.
3	Apply compost to cropland and pasture	+ Physical health/improved air, soil, and water quality - Physical Health (exposure to improperly handled materials)	Low - This measure would stand up and expand programs to support the application of compost to cropland and pasture, with the goal of applying compost to 20,000 acres annually in 2050. This reduces methane emissions from landfills by diverting waste from decomposing in landfills (an anaerobic environment).
Natural Gas Transmission and Distribution Sector			
1	Implement a mandatory emissions reduction program for natural gas T&D systems	+ Physical health/improved air quality + Energy Security - Physical health/worker safety	Medium – This measure would enhance leak detection monitoring, require natural gas companies to improve on the response times for addressing leaks, and implement a mandatory emissions reduction program for natural gas T&D systems.
2	Stop the expansion of natural gas T&D infrastructure and introduce non-pipeline alternatives	+ Physical health/improved air quality + Financial Security + Workforce Development - Physical health/air pollution - Quality of life (noise pollution, expense, infrastructure disruptions) - Financial Security	High - This measure would implement incentives to convert portions of the natural gas systems to thermal energy networks and develop tools to help with building electrification plans, like a distribution hosting capacity map or gas system planning tools.
Halogenated Gases Sector			
1	Implement a refrigerant management program	+ Physical health/improved air quality + Workforce Development - Physical health/worker safety	Medium – This measure would require facilities with air conditioning chillers and/or refrigeration systems using 50 lbs or more of a high-GWP (150 GWP or more) refrigerant to conduct and report periodic leak inspections; promptly repair leaks; and adopt service practices to reduce emissions of refrigerants.
2	Implement a refrigerant replacement incentive program	+ Physical health/improved air quality + Workforce Development + Decreased Energy costs - Physical health/exposure to harmful materials	Medium – This measure would expand existing pilot incentive programs such as NJ Cool, to support businesses, institutions and local governments, especially those in low- and moderate-income communities, to upgrade their systems with low and ultra-low GWP refrigerants.
Natural and Working Lands – Carbon Sequestration			
1	Strengthen and expand existing natural carbon sinks through reforestation, afforestation, and	+ Physical health/improved air and water quality + Mental Health + Mental Acuity + Increased resilience + Improved Energy Security	High - NJ will take a series of policies and actions that will maintain, restore and expand its natural and working lands that act as natural carbon sinks.

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	GHG Reduction Measure	Summary of Impacts	Impact Ranking for Full Population
	restoration, to at least 10 MMT CO ₂ e/year.	+ Infrastructure Protection + Workforce Development Opportunities - Installation and management costs - Physical Health (from illegal dumping, ecological changes) - Quality of life (noise pollution, expense, infrastructure disruptions)	These enabling actions may include: (1) create and expand statewide land acquisition programs that ensure conservation and low/negative carbon land uses (such as Blue Acres and Green Acres programs for acquisition of private land for conservation), (2) Implement policies and incentives to increase the ability of lands to offset GHGs and land management / sequestration of carbon, and more.
2	Protect, maintain, and avoid the conversion of natural lands, including 21,000 acres of forested lands, through high-carbon land acquisitions and policies that promote location-efficient development	+ Physical health/improved air and water quality + Mental Health + Mental Acuity + Increased resilience + Improved Energy Security + Infrastructure Protection + Workforce Development Opportunities - Installation and management costs - Physical Health (from illegal dumping, ecological changes) - Quality of life (noise pollution, expense, infrastructure disruptions)	High – This measure would create new or expand existing programs such as Green and Blue Acres to avoid the conversion of or acquire on average at least 840 acres of additional forested lands annually which may then be used as public parks, forests and wildlife areas that prevent them from being converted into non-forest, (higher emission) uses.

**COMMUNITY BENEFITS ANALYSIS
FOR THE NEW JERSEY DEPARTMENT OF ENVIRONMENTAL PROTECTION'S
COMPREHENSIVE CLIMATE ACTION PLAN (CCAP)**

- DECEMBER 5, 2025 –

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Section 1: INTRODUCTION AND METHODS

A. Introduction

A team at Rutgers, the State University of New Jersey's Bloustein School of Planning and Public Policy, conducted the community benefits analysis regarding the New Jersey GHG reduction measures. This analysis highlights the benefits associated with New Jersey's GHG reduction measures through the impacts of reduced GHG emissions and co-pollutant (e.g., PM_{2.5}, NO_x and NO₂, SO₂, VOCs, air toxics) emissions. GHG reduction measures in New Jersey will have a positive impact on human health as well as other co-benefits including increased resilience and enhanced climate adaptation, greater access to climate smart transportation alternatives, improved housing quality (e.g., energy efficiency), enhanced community green space, decreased energy costs and increased energy security, workforce development opportunities, and improved quality of life (e.g., noise reduction). In some cases, these GHG reduction measures may create disbenefits within New Jersey communities: this community benefits analysis brings these unintentional disbenefits to the fore and includes recommendations regarding how to overcome and/or mitigate those disbenefits.

This community benefits analysis builds on the research and community engagement conducted by Rutgers University for the 2024 Priority Climate Action Plan's (PCAP) Benefits Analysis. This included stakeholder feedback collected between September and December 2023 during which stakeholders provided feedback on the 2024 priority measures. Input was provided through: comments submitted online to the New Jersey Department of Environmental Protection (NJDEP) CPRG website and in direct emails, five virtual CPRG Topical Stakeholder Sessions; two virtual stakeholder engagement sessions facilitated by Sustainable Jersey; one in-person stakeholder engagement session with residents and advocacy groups in a municipality with OBCs (i.e., Newark, New Jersey), and one-on-one survey phone calls with two industrial facilities. This feedback was used to further shape the 2024 priority measures into New Jersey's 2025 GHG reduction measures.

The community benefits analysis for the CCAP consisted of three primary tasks:

- Literature Review: A literature review was conducted to identify likely outcomes and impacts of the GHG reduction measures to the full population of New Jersey, including both primary impacts and coincidental/indirect impacts. The literature review expanded on the literature review conducted for the 2024 PCAP. This literature review yielded over 750 possible sources (including guidance documents and peer reviewed articles) which were narrowed down based on a review of the abstracts of each resource for relevance.
- COBRA Quantitative Analysis: EPA's CO-Benefits Risk Assessment Health Impacts Screening and Mapping Tool was used to quantify the impacts of New Jersey's GHG reduction measures, collectively across the state. Analysis was conducted by E3 Consulting and with follow up analysis by Rutgers and NJDEP.
- Stakeholder Engagement: Stakeholder feedback on the CCAP climate mitigation and pollution issues was collected in April and June 2025 and has been integrated into this analysis. Stakeholders provided input through several meetings. One in-person community listening session was held co-hosted by the NJ NAACP's Metuchen Edison and Piscataway Branch (MEAB) and the Southern Burlington County NAACP. Three virtual stakeholder engagement sessions were co-hosted by: Tyrese Gould Jacinto (Former Vice-Chair of the NJ Environmental Justice Advisory Council; President and CEO of Native American Advancement Corp. (NAAC); Member of the Nanticoke Lenni-Lenape Nation); Marcus Sibley (Environmental & Climate Justice Chairman for the Southern Burlington County NAACP; Chairman of NJ Progressive Equitable Energy Coalition (NJPEEC)); and Helaine Barr, Assistant Director of Climate Change, Clean Energy and Sustainability at NJDEP.

The quantified benefits of the GHG reduction measures are grouped together at the state or county level (e.g., New Jersey can provide quantified health and economic benefits based on **all** GHG reduction measures each of New Jersey's 21 counties individually). These health benefits are based on ozone and particulate matter reductions. New Jersey has isolated two specific measures to highlight measure specific quantified benefits including: (1) offshore wind and (2) solar (utility-scale solar and distributed solar photovoltaics) compared to using combined-cycle natural gas generation.

B. Methods

The community benefits analysis consisted of three parts: a literature review, COBRA quantitative analysis, and stakeholder engagement. Below are additional details regarding the literature review and COBRA analysis:

- **Literature Review**

The literature review was broken into two parts: the first was a traditional literature review while the second involved gathering data via NJ Public Health Adapt.

Regarding the traditional literature review, the team conducted a thorough literature review to identify likely outcomes of proposed CCAP measures and impacts to the full population of New Jersey, including both primary impacts and secondary/indirect impacts. The search was limited to articles published after 2017 except for select, highly relevant or seminal studies from prior years. Databases used for this literature review included: EBSCO, Google Scholar, Pew Trust HIA Database, and the World Health Organization's Epidemiological Repository on Particulate Matter and Mortality.

The team used 86 key words/phrases to identify literature related to the target populations, the CCAP measures, and the impacts of concern (see Appendix C and E for list of search terms).

- The literature review yielded over 750 possible sources which were narrowed down based on a review of the abstracts of each resource for relevance. The possible benefits and disbenefits supported by the literature are summarized in [Sections 1](#) and [2](#) of this report. Section 1 provides a “at-a-glance” summary ranking table of the community benefits analysis while Section 2 provides a table and narrative with additional detail. The ranking schema of “high” “medium” and “low” identifies CCAP measures according to their expected positive impact on the full New Jersey population.

Regarding the NJ Public Health Adapt research, public health data is essential for identifying communities at greatest risk from climate-related health impacts. By tracking patterns in environmental exposures, chronic disease, and social vulnerability, public health data allows us to pinpoint “hot spots” where people face greater risks to their health and well-being. This information is critical for directing resources, guiding adaptation strategies, and improving health outcomes for the most vulnerable populations. NJ Public Health Adapt is an online data visualization and mapping tool that generates information regarding the impacts of climate change conditions on public health at a county and municipal level. NJ Public Health Adapt uses data compiled from authoritative sources (*e.g.*, US Census, US Centers for Disease Control and Prevention, the New Jersey Department of Transportation, the Northeast Regional Climate Center at Cornell University). The tool provides a summary of the climate conditions that impact health, the existing health conditions in an area that can be exacerbated by climate change, the Heat Vulnerability Index, and sociodemographic factors at greater risk of negative health outcomes from climate change. This online tool was developed by Rutgers to support efforts at the state, regional, and local levels to understand the impacts that changing climate conditions may have on public health, as well as to support efforts to adapt to changing climate conditions in ways that improve health outcomes. For this community benefits analysis, NJ Public Health Adapt's County Wide Reports were used as well as Headwater Economics to collect basic demographic information for select counties in the state.¹

- **COBRA Quantitative Analysis**

¹ Headwater Economics is an independent, nonprofit research group that works to improve community development and land management decisions.

COMPREHENSIVE CLIMATE ACTION PLAN: APPENDICES

The quantified benefits of the GHG reduction measures have been generated based on using EPA's CO-Benefits Risk Assessment Health Impacts Screening and Mapping Tool (COBRA tool) with a focus on the air quality related health impacts of the New Jersey GHG reduction measures.²

A quantitative analysis of the health impacts of New Jersey's GHG reduction measures was conducted using COBRA. The community benefits analysis uses 2020 National Emissions Inventory (NEI) data from the EPA as well as COBRA analysis outputs to (1) conduct a base year estimate of co-pollutants (including criteria pollutants/precursors and air toxics) using the year 2025 as the base year and (2) provide estimates of co-pollutant emissions reductions (both quantified and monetized) for the years 2035 and 2050 as GHG emissions reduction measures are implemented.³ New Jersey is providing estimates for three future climate pathway scenarios (*i.e.*, Scenarios) as described below, as well as in Table 1 and Figure 1:

- a. Business as Usual (BAU) Scenario:
 - i. BAU Scenario Definition: The BAU Scenario does not include any climate pollutant reduction policies (*i.e.*, it does not include any federal, state, or regional policies of that nature), just population growth and changes that occur naturally over time, such as motor vehicles retiring and being replaced with newer models (*i.e.*, models from the early 2020s). In terms of the Electricity Generation and Demand Sector, for example, the BAU fossil generation share is assumed to remain flat (and scale with generation levels). Also, the BAU Scenario is not intended to represent a real-world condition. Instead, it establishes a reference situation from which the State's progress can be measured.
 - ii. Quantifying the BAU Scenario: The BAU Scenario was calculated using NEI 2020 values and then scaling those values using COBRA 2025 estimates of co-pollutant emissions. In this way, the core estimates of co-pollutant reductions were based on measured co-pollutant emissions in 2020 and were subsequently adjusted to reflect percent changes in COBRA values.
- b. Current Policies (CP) Scenario:
 - i. CP Scenario Definition: This scenario includes finalized state and federal policies as of 2024, but it excludes voluntary targets without enforcement mechanisms. As such, this scenario explores how far existing state and federal policies could get New Jersey toward achieving its emissions targets.
 - ii. Quantifying the CP Scenario: This scenario is compared to the BAU Scenario to identify the benefits of moving from the BAU CCAP scenario pathway to the CP Scenario.
- c. CCAP Scenario:
 - i. CCAP Scenario Definition: The CCAP Scenario includes ambitious electrification, but with increased efficiency measures to reduce bulk grid demands sufficient to achieve the 80x50 goal. As such, this CCAP Scenario explores how energy efficiency and conservation can reduce the costs of decarbonization through peak load management.
 - ii. Quantifying the CCAP Scenario: This CCAP Scenario is compared with the CP Scenario to identify the benefits of moving from the CP scenario pathway to that described in the CCAP scenario.

² Additional context for COBRA experts: New Jersey selected the default baseline year established by the COBRA tool (2023) rather than 2024 because there was an issue with the interface setup during the time that the analysis was conducted. These baselines were used to create the 2025, 2035, and 2050 outputs used in the quantitative analyses.

³ See [Section 2.A's "Anticipated Projected Future Co-Pollutant Emissions With and Without GHG Reduction Measures"](#) for a detailed description of how (1) the NEI's 2020 data and (2) outputs from COBRA's 2025, 2035 and 2050 analyses, were used to generate values for this Benefit Analysis' 2025 base year and the 2035 and 2050 years of estimated co-pollutant emissions.

The term “Total Benefits” will be used to describe the sum of all the benefits found above the BAU Scenario (*i.e.*, the sum of the CP Scenario and the CCAP Scenario, or the sum of the “BAU compared to the CP scenario” and the “CP scenario compared to the CCAP scenario”). This demonstrates the full breadth of benefits of implementing the CCAP Scenario. The term “Additional Benefits” will be used to describe the benefits found above the CP Scenario (*i.e.*, the benefits of the CCAP Scenario alone).

Table 1. Specifics regarding each of the relevant CCAP scenarios considered in this CCAP including the Business as Usual (BAU), Current Policy (CP), and CCAP Scenarios.

Business as Usual	Current Policy	CCAP Scenario
A scenario that contains no current or prospective energy policies, only population growth and changes that occur with time (e.g., cars retiring and being replaced with 2025 models). <i>Why this scenario:</i> This scenario explores emission levels if there were no policy constraints on emissions or electricity generation.	Includes finalized state and federal policies as of 2024, but excludes voluntary targets without enforcement mechanism: • 50% renewable portfolio standard and 5 GW of offshore wind by 2030 • Heat pump adoption increases slowly but steadily, gas use in buildings declines ~25% by 2050 • Advanced Clean Cars and Advanced Clean Trucks programs drive significant ZEV adoption • EPA regulations reduce refrigerant emissions <i>Why this scenario:</i> This scenario explores how far existing state and federal policies could get New Jersey towards achieving its emissions targets.	Includes ambitious electrification, but with increased efficiency measures to reduce bulk grid demands: • 100% clean electricity standard by 2035 • Over 60% of existing homes and commercial buildings have envelope upgrades by 2050 • 5 GW of customer-sited solar added by 2050 • Managed EV charging to reduce peak load • VMT reductions from urban design and public transit <i>Why this scenario:</i> This scenario explores how energy efficiency and conservation can reduce the costs of decarbonization through peak load management.

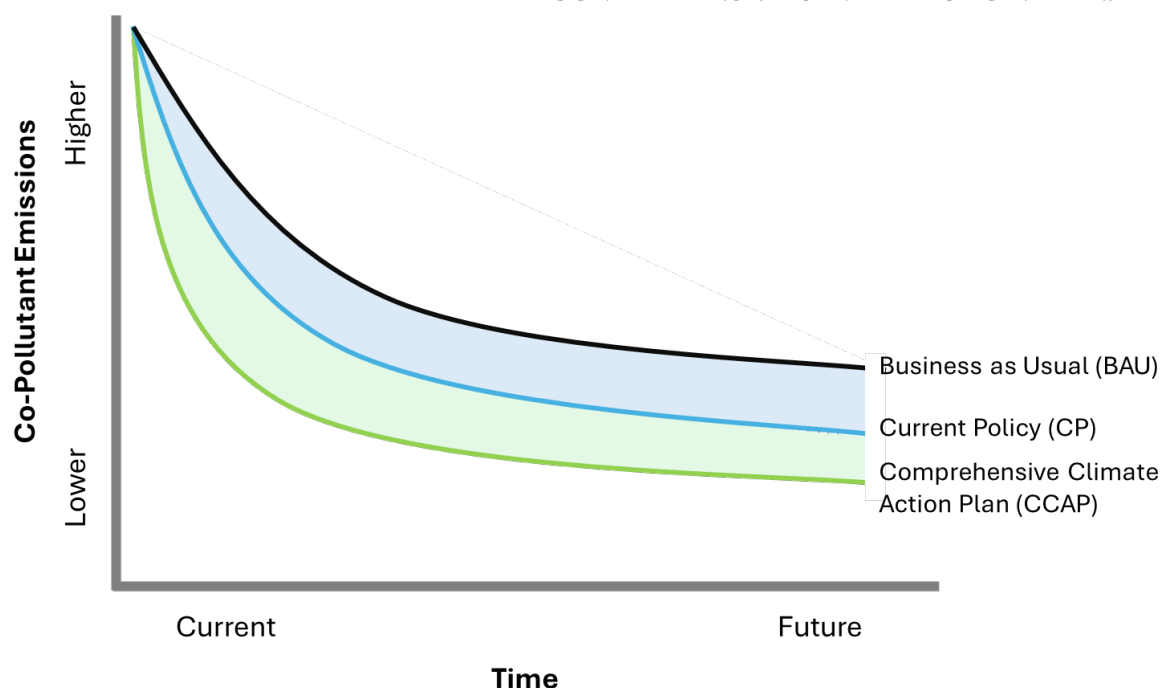


Figure 1. A hypothetical, idealized comparison between pollutant emissions (y-axis) and time (x-axis) showing a decrease in emissions for the BAU, CP and CCAP Scenarios. This is indicated by the black, blue, and green lines, respectively. In most cases, the CCAP Scenario will experience the greatest decrease in pollutant emissions. The reduction in emissions each year under the CP Scenario is represented by the light blue shading (i.e., the benefits of moving from the BAU Scenario to the CP Scenario). The reduction in emissions each year under the CCAP Scenario is represented by the light green shading (i.e., the benefits of moving from the CP Scenario to the CCAP Scenario) this is also known as the “additional benefits” of the GHG reduction measures in the CCAP Scenario). The “total benefits” of the GHG reduction measures in the CCAP Scenario are quantified by summing the benefits each year represented in light blue and light green (i.e., the sum of the BAU Scenario compared to the CP Scenario and the CP Scenario compared to the CCAP Scenario).

SECTION 2. QUANTIFIED ESTIMATES OF CO-POLLUTANT REDUCTIONS, HEALTH BENEFITS and COUNTY DEMOGRAPHICS for FULL POPULATION

A. Quantified Estimates of Co-Pollutant Reductions for Full Population

Consistent with the CPRG Program's Technical Reference Document on Benefits Analyses regarding co-pollutant impacts ([2023](#)) and the CPRG Program's Formula Grants for Planning guidance document ([2023](#)), New Jersey's co-pollutant impact community benefits analysis based on emissions should include (1) a base year inventory and (2) anticipated projected future co-pollutant emissions with and without GHG reduction measures. Below are the findings from these analyses.

Base Year Inventory

The baseline of co-pollutant emissions was established for ammonia, nitrogen oxides, particulate matter with a diameter of 2.5µm or less (PM_{2.5})⁴, sulfur dioxide, and volatile organic compounds (VOC). All data for the base year inventory was compiled using NEI data from 2020. It excluded the following emissions as they are beyond the scope of the CCAP: biogenic emissions, agricultural fires, prescribed burns, and forest wildfires. New Jersey's inventory can be found in Table 2 below.

Table 2. 2020 Baseline co-pollutant emissions statewide. Statewide totals for each pollutant are included. Data source: EPA's NEI Retrieval Tool, [Tier 3 Summary by County](#).

Co-Pollutant	Statewide NEI 2020 Emissions (short tons)
Nitrogen Oxides	87,642
Sulfur Dioxide	2,670
Ammonia	8,219
PM _{2.5} Primary	25,836
Volatile Organic Compounds	122,816

Anticipated Projected Future Co-Pollutant Emissions with and without GHG Reduction Measures

Several co-pollutant emissions were estimated for the years 2035 and 2050 using COBRA. Emissions were estimated for ammonia, nitrogen oxides (using nitrogen dioxide, or NO₂, as a proxy), PM_{2.5}, sulfur dioxide and VOC.⁵ Emissions are estimated for each of the following scenarios:

1. Co-Pollutant Emissions Without GHG Reduction Measures – This is the BAU Scenario as described in [Section 1.B](#). The BAU Scenario does not include any climate pollutant reduction policies (i.e., it does not include any federal, state, or regional policies of that nature), just population growth and changes that occur naturally over time, such as motor vehicles retiring and being replaced with newer models (i.e., models from the early 2020s).
2. Co-Pollutant Emissions With GHG Reduction Measures – As described in [Section 1.B](#), this CCAP explores two future climate pathway scenarios (i.e., the CP Scenario and the CCAP Scenario), which are measured against a

⁴ PM_{2.5} selected is the NEI "PM_{2.5} Primary" pollutant.

⁵ COBRA only provides outputs for nitrogen dioxide as opposed to nitrogen oxides. We will use the term nitrogen dioxides here as nitrogen dioxide can be used as a proxy for nitrogen oxide values as nitrogen dioxide is a major component of nitrogen oxides, and is often used as a representative indicator for the larger group of nitrogen oxides ([EPA 2025](#)).

BAU scenario to show the total co-pollutant emissions avoided in years 2035 and 2050.⁶ State totals are provided.

All co-pollutant emissions estimates in this analysis are based on the NEI data from 2020 because the NJDEP found the measured, real-world values for co-pollutant emissions available from the NEI 2020 data were the best starting point for this analysis. To calculate co-pollutant emissions, NEI values were multiplied by the percentage change in emissions calculated in COBRA. This required a series of specific steps which are highlighted below and explored in detail in Appendix A:

1. Using 2025 COBRA Emissions Values to Calibrate the NEI 2020 Baseline equivalent for 2025 and 2035 – COBRA 2025 values were used as a proxy for the 2020 NEI values because it was important for all percent change values to be derived from the same dataset. The percent change between the BAU Scenario's 2025 and 2035 values were calculated for each co-pollutant and applied to the 2020 NEI to generate adjusted 2025 and 2035 BAU values.
2. Calculate Percent Change to the CP Scenario for 2035 – The percent change from the 2035 BAU Scenario to the 2035 CP Scenario were calculated for each co-pollutant and applied to the adjusted 2035 BAU values above to generate adjusted 2035 CP Scenario values.
3. Calculate Percent Change to the CCAP Scenario for 2035 – The percent change from the 2035 Current Policies Scenario to the 2035 CCAP Scenario were calculated for each co-pollutant and applied to the adjusted 2035 CP Scenario values above to generate adjusted 2035 CCAP Scenario values.
4. Calculate Percent Change between BAU and CCAP Scenarios for 2035 – The percent change from the adjusted 2035 BAU Scenario to the adjusted 2035 CCAP Scenario was calculated for each co-pollutant.
5. Steps 1-4 Above were repeated for the 2050 COBRA data.

Co-pollutant annual emissions for (a) 2020 (NEI baseline) and 2035, and (b) 2020 and 2050, both with and without GHG Reduction Measures, are available in Tables 3 and 4 below, respectively. These tables include the emissions values under the BAU, CP, and CCAP Scenarios.

⁶ The CCAP Scenario impacts are discussed in two ways in this analysis: (1) the comparison of the CCAP Scenario to BAU (*i.e.*, the total benefits of the CCAP Scenario) or (2) the comparison of the CCAP Scenario to the CP Scenario (*i.e.*, the additional benefits of CCAP).

Table 3. Total co-pollutant emissions in the years 2020 and 2035 for the baseline as well as the BAU, CP, and CCAP Scenarios for five co-pollutants. This includes nitrogen oxides (using nitrogen dioxide as a proxy), sulfur dioxide, ammonia, PM_{2.5} and VOC. Values are provided in short tons unless otherwise noted.

Co-pollutant emissions are reduced by 3% to 18% in terms of the full benefits under the CCAP Scenario.

Co-Pollutant Emissions, 2020 & 2035						
Co-Pollutant	NEI 2020 Emissions	Adjusted 2035 BAU Emissions	Adjusted 2035 CP Emissions	Adjusted 2035 CCAP Emissions	Total 2035 Emissions Avoided, CCAP	Percentage Avoided Emissions, CCAP, 2035
Nitrogen Oxides	87,642.20	84,914.63	75,820.60	69,802.68	15,111.95	17.80%
Sulfur Dioxide	2,670.31	2,752.84	2,643.69	2,588.46	164.38	5.97%
Ammonia	8,219.01	7,680.79	6,905.72	6,732.33	948.46	12.35%
PM _{2.5} Primary (Filt + Cond)	25,836.38	25,901.36	25,375.66	25,091.04	810.32	3.13%
Volatile Organic Compounds	122,815.82	115,532.46	109,065.94	108,060.92	7,471.55	6.47%

Table 4. Total co-pollutant emissions in the years 2020 and 2050 for the baseline as well as the BAU, CP, and CCAP Scenarios for five co-pollutants. This includes nitrogen oxides (using nitrogen dioxide as a proxy), sulfur dioxide, ammonia, PM_{2.5} and VOC. Values are provided in short tons unless otherwise noted.

Co-pollutant emissions are reduced by 10% to 48% in terms of the full benefits under the CCAP Scenario.

Co-Pollutant Emissions, 2020 & 2050						
Co-Pollutant	NEI 2020 Emissions	Adjusted 2050 BAU Emissions	Adjusted 2050 CP Emissions	Adjusted 2050 CCAP Emissions	Total 2050 Emissions Avoided, CCAP	Percentage Avoided Emissions, CCAP, 2050
Nitrogen Oxides	87,642.20	85,796.35	63,103.13	44,628.87	41,167.48	47.98%
Sulfur Dioxide	2,670.31	2,954.28	2,711.19	2,525.04	429.24	14.53%
Ammonia	8,219.01	7,643.64	5,610.08	4,733.41	2,910.24	38.07%
PM _{2.5} Primary (Filt + Cond)	25,836.38	26,312.61	24,917.35	23,778.95	2,533.66	9.63%
Volatile Organic Compounds	122,815.82	114,082.55	98,384.55	94,679.20	19,403.35	17.01%

Figure 2. Statewide avoided co-pollutant emissions in 2035 and 2050 associated with achieving the CCAP Scenario. Annual projected emissions of NO_x, SO₂, Ammonia, PM_{2.5}, and VOC compared to the BAU are presented in short tons. VOC emissions decrease by over 19,000 short tons and NO_x emissions decrease by over 41,000 short tons with the achievement of the CCAP Scenario.

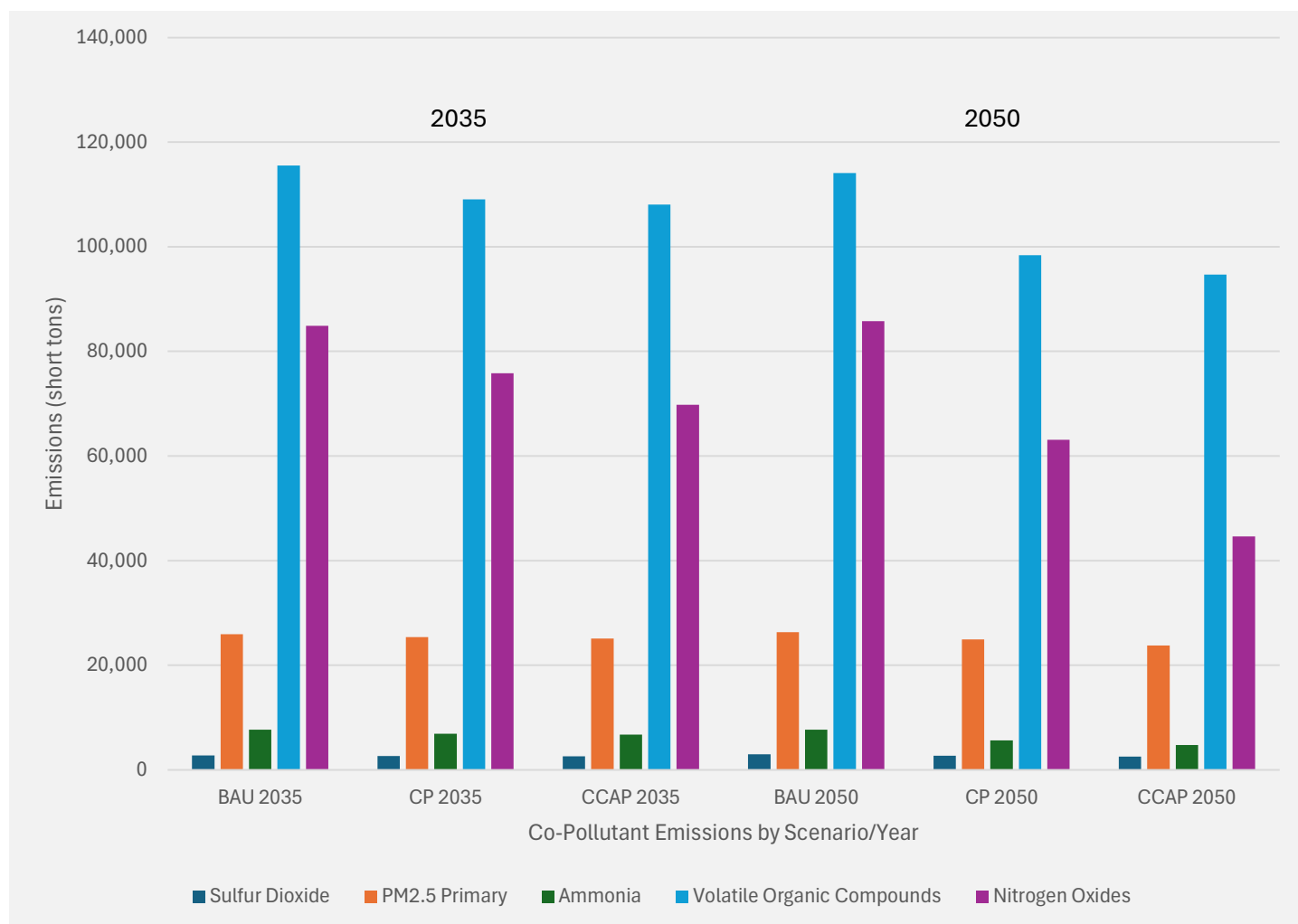
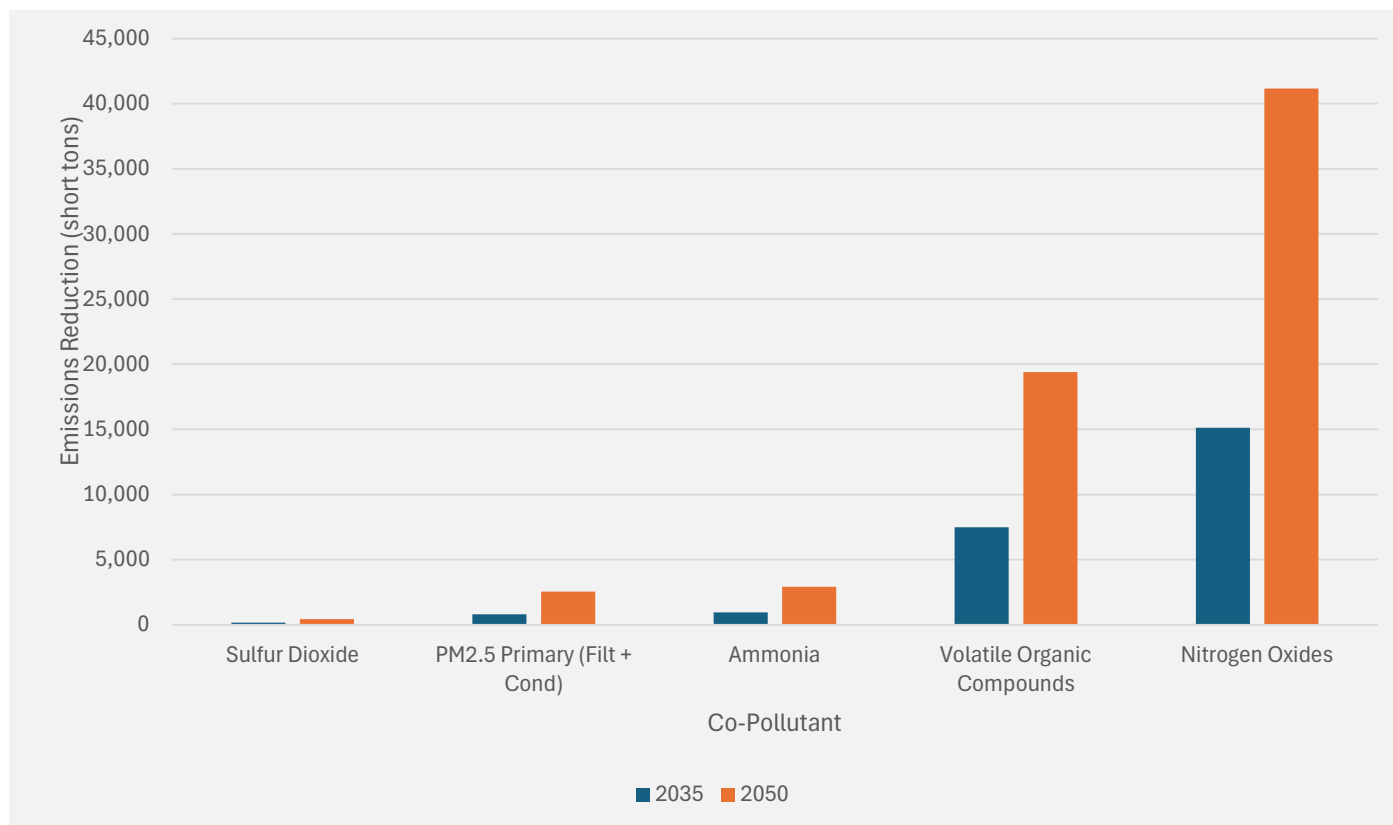


Figure 3. Co-Pollutants' total avoided emissions from the full implementation of the CCAP Scenario in 2035 and 2050.

Annual projected avoided co-pollutant emissions of NO_x, SO₂, Ammonia, PM_{2.5}, and VOC compared to the BAU are shown for years 2035 and 2050. Avoided emissions of all co-pollutants combined reach more than 66,000 short tons in 2050.



Overall, estimated co-pollution emissions reductions are greater in 2050 than 2035: When considering the total benefits of the CCAP Scenario, the amount of estimated co-pollution reductions for each co-pollutant across the entire state of New Jersey was higher in 2050 than 2035 (Tables 3-4). For example, the total mass of avoided NO₂ emissions under the CCAP Scenario was 15,578 short tons in 2035, which increased to 42,436.45 short tons in 2050 (Tables 3 - 4).

B. Statewide Quantified Health Benefits from Air Quality Improvement

The results of the COBRA outputs for the anticipated future quantified and monetized health benefits of the GHG Reduction Measures for New Jersey are provided below and in Appendix B for the CP Scenario, CCAP Scenario, and total benefits of the CCAP Scenario's GHG reduction measures (see [Section 1.B](#) for a description of each) for the years 2035 and 2050. Quantified and monetized benefits are for the entire state of New Jersey. All quantified and monetized benefits are for the designed year and are not cumulative among years (*i.e.*, the benefits in 2050 include only the benefits in 2050 as opposed to including all previous years). For quantified and monetized benefits for select GHG Reduction Measures, see [Section 2.D](#) below.

The quantified health benefits are measured in units of "change in incidence." For example, the hospital admission (HA) endpoints (*e.g.*, all cardiovascular, all respiratory, asthma, chronic lung disease) refer to the change in the number of the people admitted to a hospital for one of the four health endpoints identified. It is appropriate to report results in this way; **however, it is important to note that each change in incidence is a calculated value based on a change in risk for each of the endpoints.** Each of the health impact functions has a unique risk factor which can vary across location, demographic, and change in concentration of either PM_{2.5} or ozone. This could include a calculation of statistical lives saved (or SLS) (*e.g.*, if 150,000 people experienced a 0.001% reduction in mortality risk, this would be 1.5 SLS). Below is a

list of all the health endpoints used in this analysis. A detailed description of health effects and their economic values, as well as the “change in risk” calculation sources, is provided at the start of Appendix B.

- Acute Bronchitis
- Acute Myocardial Infarction (AMI), Nonfatal (high estimate)
- Acute Myocardial Infarction (AMI), Nonfatal (low estimate)
- Asthma Exacerbation, Cough (known as “Asthma Symptoms, Cough” in COBRA materials)
- Asthma Exacerbation, Shortness of Breath (known as “Asthma Symptoms, Shortness of Breath” in COBRA materials)
- Asthma Exacerbation, Wheeze (known as “Asthma Symptoms, Wheeze” in COBRA materials)
- Emergency Room Visits, Asthma
- Hospital Admission (HA), All Cardiovascular (less Myocardial Infarctions) Hospital Admission (HA) (known as “Hospitalization, Cardio-, Cerebro-, and Peripheral Vascular Disease” in COBRA materials)
- All Respiratory Hospital Admission (HA) (known as “Hospitalization, All Respiratory” in COBRA materials)
- Hospital Admission (HA), Asthma
- Hospital Admission (HA), Chronic Lung Disease
- Lower Respiratory Symptoms
- Minor Restricted Activity Days
- Mortality, All Cause (low estimate)
- Mortality, All Cause (high estimate)
- Infant Mortality
- Upper Respiratory Symptoms
- Work Loss Days

Using the total benefits of the CCAP Scenario’s GHG reduction measures for 2035 and 2050, Rutgers identified three cross-cutting insights that are relevant to the co-pollutant emissions reductions to highlight the positive impact these measures will have on New Jersey. For this summary, Rutgers considered each of the eighteen quantified health benefits (or “health outcomes”) and identified the three counties that had the greatest positive value for each health benefit (highlighted in yellow in Tables 9 and 10) and the three counties that had the lowest positive value for each health benefit (highlighted in red in Tables 9 and 10).

1. **Estimated Health Benefits Increase from 2035 to 2050:** Taking the average value for each of the eighteen health outcomes across all New Jersey counties indicates that for the total benefits of the CCAP Scenario’s GHG reduction measures, the average benefit increases between 2035 and 2050 (Table 9 and 10). For example, in 2035 the total benefits of the CCAP Scenario’s GHG reduction measures indicate on average the GHG reduction measures save an average of 219 work loss days per county a year, whereas in 2050 the GHG reduction measures save an average of 640 work loss days per county a year. This means, the number of workdays saved increases between 2035 and 2050 under the full benefits of the CCAP Scenario. Values for the CP and CCAP Scenarios are available in Appendix B (Tables 1 – 4).
2. **Total Economic Value of Estimated Health Benefits in 2035 and 2050:** The monetized benefits for all measured health outcomes in all counties are substantial and is summarized in Table 11 for the CP Scenario, CCAP Scenario, and total benefits of the CCAP Scenario’s GHG reduction measures (county breakdown available in Appendix B, Tables 5-10). Monetized benefits increase by \$2.36 billion dollars between 2035 and 2050. Moreover, GHG reduction measures will save the state money. For example, in 2035, the state will save approximately \$777 million by implementing the GHG reduction measures consistent with the CP Scenario and will save approximately \$1.2 billion by implementing the GHG reduction measures consistent with the total benefits of the CCAP Scenario’s GHG reduction measures. These monetary savings increase in 2050 when the state will save

approximately \$2.0 billion by implementing the GHG reduction measures consistent with the CP Scenario and will save approximately \$3.6 billion by implementing the GHG reduction measures consistent with the total benefits of the CCAP Scenario's GHG reduction measures.

3. **The Three Counties Contributing the Most and Least Estimated Health Benefits Were Consistent Between 2035 and 2050:** When considering the total benefits of the CCAP Scenario's GHG reduction measures, the top three counties with the greatest health benefits and the three counties with the lowest health benefits were the same for each estimated health outcome between 2035 and 2050, with one exception (Table 9 and 10). The "HA, All Cardiovascular (less Myocardial Infarctions)" in 2035 includes Hudson in one of the top three counties with the greatest health benefits, and in 2050 this health outcome's top three counties includes Middlesex rather than Hudson. This suggests that long-term implementation of GHG reduction measures will be key in sustaining positive health outcomes in New Jersey.

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Table 9. Quantified Benefits, 2035, Total Benefits of the CCAP Scenario's GHG Reduction Measures. Quantified health benefits for all counties in New Jersey based on this scenario of GHG Reduction Measures. Unless otherwise noted, the units in this table are "change in incidence" (cases, annual) with positive values indicating health improvements. Using "ER Visits, Asthma" for Hudson County as an example, in 2035 there will be 3.99 fewer asthma induced emergency room visits due to the improved air quality from all of New Jersey's GHG Reduction Measures. Cells shaded in yellow (orange) indicate the counties with the top three highest (bottom three lowest) values for a given health outcome. See [Section 2.B](#) for definitions of health benefits below.

County	Acute Bronchitis	AMI, Nonfatal (high)	AMI, Nonfatal (low)	Asthma Exacerb., Cough	Asthma Exacerb., Shortness of Breath	Asthma Exacerb., Wheeze	Emergency Room Visits, Asthma	HA, All Cardiovasc.	HA, All Respiratory	HA, Asthma	HA, Chronic Lung Disease	Lower Respiratory Symptoms	Minor Restricted Activity Days	Mortality, All Cause (low)	Mortality, All Cause (high)	Infant Mortality	Upper Respiratory Symptoms	Work Loss Days
Atlantic	0.64	0.48	0.05	2.71	3.65	5.57	0.36	0.12	0.08	0.01	0.03	8.13	343.51	0.53	1.21	0.00	11.59	57.81
Bergen	6.17	5.06	0.55	26.43	35.59	54.38	3.72	1.27	0.83	0.11	0.29	78.49	3,723.43	4.64	10.48	0.01	111.83	626.34
Burlington	1.37	1.17	0.13	5.86	7.90	12.07	0.98	0.42	0.21	0.04	0.10	17.35	806.19	1.26	2.86	0.00	24.69	135.34
Camden	2.38	1.31	0.14	9.93	13.37	20.43	0.74	0.35	0.22	0.03	0.04	30.27	1,208.10	1.83	4.15	0.01	43.10	204.52
Cape May	0.10	0.14	0.01	0.42	0.56	0.86	0.06	0.03	0.03	0.00	0.01	1.29	58.01	0.15	0.35	0.00	1.83	9.68
Cumberland	0.25	0.20	0.02	1.06	1.42	2.18	0.21	0.05	0.03	0.01	0.02	3.20	128.05	0.19	0.43	0.00	4.55	21.76
Essex	7.16	4.39	0.47	30.35	40.87	62.44	2.95	1.01	0.46	0.14	0.19	91.20	3,713.63	4.05	9.19	0.03	130.16	626.66
Gloucester	1.28	1.98	0.21	5.58	7.51	11.48	1.23	0.42	0.26	0.06	0.13	16.33	735.86	1.17	2.65	0.00	23.26	123.22
Hudson	4.33	2.56	0.28	17.54	23.62	36.09	3.99	0.78	0.31	0.13	0.25	55.00	2,575.56	2.06	4.65	0.01	78.13	445.46
Hunterdon	0.27	0.40	0.04	1.20	1.62	2.47	0.13	0.09	0.06	0.00	0.02	3.40	195.72	0.28	0.64	0.00	4.85	32.10
Mercer	1.73	1.61	0.17	7.53	10.14	15.50	0.99	0.37	0.23	0.04	0.09	22.01	984.52	1.21	2.74	0.01	31.32	166.23
Middlesex	6.35	4.98	0.54	27.59	37.15	56.77	1.22	0.76	0.60	0.06	0.11	80.83	3,775.59	4.30	9.73	0.01	115.23	641.97
Monmouth	2.90	3.04	0.33	12.48	16.80	25.67	2.11	0.76	0.48	0.07	0.19	36.90	1,684.01	2.62	5.91	0.01	52.63	280.53
Morris	1.83	1.83	0.20	7.82	10.53	16.09	0.70	0.44	0.26	0.03	0.07	23.28	1,085.34	1.47	3.32	0.00	33.19	181.40
Ocean	2.18	2.30	0.25	9.01	12.13	18.53	0.92	0.55	0.37	0.05	0.06	27.69	943.56	2.19	4.95	0.00	39.38	158.71
Passaic	2.33	1.24	0.13	9.95	13.40	20.47	0.47	0.29	0.17	0.02	0.04	29.60	1,178.50	1.35	3.05	0.01	42.19	199.55
Salem	0.11	0.13	0.01	0.45	0.61	0.93	0.05	0.03	0.02	0.00	0.00	1.37	56.65	0.11	0.25	0.00	1.95	9.48
Somerset	1.57	1.28	0.14	6.69	9.01	13.76	1.23	0.41	0.22	0.05	0.10	19.93	934.95	1.12	2.54	0.00	28.38	156.96
Sussex	0.23	0.22	0.02	0.99	1.33	2.03	0.15	0.06	0.04	0.00	0.02	2.87	146.02	0.23	0.52	0.00	4.09	24.17
Union	5.30	2.85	0.31	22.54	30.35	46.37	1.05	0.69	0.38	0.05	0.11	67.43	2,809.01	3.17	7.17	0.01	96.11	473.79
Warren	0.18	0.22	0.02	0.80	1.07	1.64	0.06	0.05	0.03	0.00	0.01	2.29	120.10	0.20	0.44	0.00	3.26	19.98
County Average	2.32	1.78	0.19	9.85	13.27	20.27	1.11	0.42	0.25	0.04	0.09	29.47	1,295.54	1.62	3.68	0.01	41.99	218.84
State Total	48.63	37.38	4.02	206.92	278.65	425.74	23.31	8.92	5.28	0.92	1.86	618.84	27,206.30	34.12	77.21	0.14	881.72	4,595.68

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Table 10. Quantified Benefits, 2050, Total Benefits of the CCAP Scenario's GHG Reduction Measures. Quantified health benefits for all counties in New Jersey based on this scenario of GHG Reduction Measures. Unless otherwise noted, the units in this table are "change in incidence" (cases, annual) with positive values indicating health improvements. Using "ER Visits, Asthma" for Hudson County as an example, in 2050 there will be 11.31 fewer asthma induced emergency room visits due to the improved air quality from all of New Jersey's GHG Reduction Measures. Cells shaded in yellow (orange) indicate the counties with the top three highest (bottom three lowest) values for a given health outcome. The bolded yellow cell indicates the one health benefit top or bottom three assignment that deviates from 2035. See [Section 2.B](#) for definitions of health benefits below.

County	Acute Bronchitis	AMI, Nonfatal (high)	AMI, Nonfatal (low)	Asthma Exacerb., Cough	Asthma Exacerb., Shortness of Breath	Asthma Exacerb., Wheeze	Emergency Room Visits, Asthma	HA, All Cardiovasc.	HA, All Respiratory	HA, Asthma	HA, Chronic Lung Disease	Lower Respiratory Symptoms	Minor Restricted Activity Days	Mortality, All Cause (low)	Mortality, All Cause (high)	Infant Mortality	Upper Respiratory Symptoms	Work Loss Days
Atlantic	1.78	1.33	0.14	7.56	10.18	15.55	1.00	0.33	0.22	0.03	0.07	22.68	958.62	1.49	3.37	0.01	32.34	161.35
Bergen	18.07	14.84	1.60	77.56	104.43	159.58	10.92	3.72	2.43	0.33	0.85	230.08	10,921.80	13.60	30.72	0.04	328.15	1,837.50
Burlington	3.81	3.26	0.35	16.37	22.05	33.69	2.74	1.17	0.58	0.11	0.28	48.43	2,250.48	3.53	7.98	0.01	68.93	377.83
Camden	6.50	3.57	0.39	27.16	36.57	55.88	2.03	0.95	0.61	0.09	0.12	82.75	3,303.54	5.00	11.34	0.03	117.88	559.31
Cape May	0.29	0.39	0.04	1.19	1.60	2.45	0.16	0.10	0.07	0.01	0.02	3.66	165.12	0.44	0.98	0.00	5.21	27.55
Cumberland	0.71	0.56	0.06	2.99	4.02	6.14	0.60	0.14	0.08	0.03	0.04	9.02	361.53	0.53	1.20	0.00	12.85	61.44
Essex	21.00	12.87	1.39	89.12	120.01	183.37	8.66	2.95	1.34	0.40	0.54	267.55	10,902.10	11.89	26.98	0.08	382.25	1,840.01
Gloucester	3.52	5.41	0.58	15.29	20.59	31.46	3.37	1.14	0.72	0.17	0.36	44.73	2,016.42	3.20	7.26	0.01	63.74	337.69
Hudson	12.26	7.24	0.78	49.72	66.95	102.29	11.31	2.22	0.89	0.37	0.71	155.75	7,297.33	5.83	13.17	0.03	221.42	1,262.28
Hunterdon	0.75	1.12	0.12	3.39	4.57	6.99	0.37	0.25	0.18	0.01	0.06	9.59	552.61	0.79	1.80	0.00	13.68	90.65
Mercer	4.90	4.56	0.49	21.35	28.74	43.92	2.81	1.04	0.65	0.11	0.26	62.33	2,789.65	3.42	7.75	0.02	88.77	471.06
Middlesex	19.97	15.65	1.69	86.88	116.99	178.76	3.83	2.39	1.88	0.20	0.35	254.26	11,885.07	13.54	30.62	0.04	362.89	2,021.18
Monmouth	8.53	8.95	0.96	36.75	49.49	75.61	6.20	2.23	1.41	0.19	0.55	108.60	4,958.66	7.70	17.41	0.02	155.00	826.11
Morris	5.15	5.16	0.56	22.05	29.69	45.37	1.96	1.24	0.73	0.10	0.18	65.58	3,058.92	4.14	9.34	0.01	93.56	511.28
Ocean	6.21	6.56	0.71	25.71	34.62	52.89	2.61	1.56	1.05	0.13	0.17	79.01	2,692.63	6.26	14.13	0.01	112.39	452.94
Passaic	6.37	3.40	0.37	27.27	36.72	56.10	1.28	0.79	0.47	0.05	0.10	81.08	3,229.56	3.69	8.36	0.02	115.62	546.90
Salem	0.31	0.38	0.04	1.31	1.76	2.69	0.14	0.08	0.05	0.00	0.01	3.96	163.37	0.32	0.72	0.00	5.63	27.35
Somerset	4.44	3.63	0.39	18.97	25.54	39.02	3.49	1.16	0.61	0.15	0.27	56.47	2,650.56	3.18	7.19	0.01	80.47	445.02
Sussex	0.64	0.63	0.07	2.79	3.75	5.74	0.41	0.16	0.11	0.01	0.06	8.11	413.25	0.65	1.47	0.00	11.57	68.41
Union	16.27	8.75	0.94	69.33	93.36	142.65	3.22	2.12	1.18	0.16	0.34	207.17	8,637.50	9.74	22.02	0.04	295.68	1,457.16
Warren	0.51	0.62	0.07	2.23	3.01	4.60	0.18	0.15	0.09	0.01	0.02	6.43	336.50	0.55	1.24	0.00	9.15	55.98
County Average	6.76	5.19	0.56	28.81	38.79	59.27	3.21	1.23	0.73	0.13	0.26	86.06	3,787.87	4.74	10.72	0.02	122.72	639.95
State Total	141.98	108.89	11.74	604.97	814.64	1,244.75	67.32	25.88	15.35	2.67	5.38	1,807.24	79,545.25	99.49	225.08	0.41	2,577.18	13,439.01

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Table 11. The Total monetized benefits of all measured health outcomes for all 21 counties in New Jersey annually in 2035 and 2050 for each scenario. Values in millions of dollars (2024 USD). For example, under the Current Policy Scenario, the State will save \$778 million in 2035 and \$1.999 billion in 2050.

Year	Current Policy	CCAP	Full Benefits of CCAP
2035	777.66	453.17	1,230.83
2050	1,999.43	1,588.96	3,588.39

C. Measures with Quantified Air Quality Benefits

Select GHG Reduction Measures have been identified for quantified and monetized benefits using COBRA. Specifically, this analysis pertains to all measures related to the adoption of renewable energy in New Jersey via offshore wind (OSW) and solar (utility-scale solar and distributed solar-PV) instead of combined cycle natural gas (CCNG). The adoption of these forms of renewable energy has been shown to improve air quality and human health.

This analysis was conducted to estimate the health benefits of the three renewable resource types, OSW, utility-scale solar, and distributed solar. Avoided emissions were based on the emissions from combined-cycle natural gas generators that would be operated in the absence of the renewable assets. The emissions rate from the hypothetical combined-cycle units were based on the combined-cycle units in operation in New Jersey in 2023, based on data from the USEPA eGrid database.

Findings are summarized in Tables 12-14 below. A low and high total health benefit is provided for each of these renewable resources to more accurately capture the breadth of possible health benefits. The following is an exhaustive list of the health benefits utilized in this analysis: Infant Mortality, Mortality, Asthma Symptoms (including albuterol use, chest tightness, cough, shortness of breath, wheeze), hay fever/rhinitis, ER Visits (for respiratory causes and asthma), Hospital Admittances (for respiratory causes), Nonfatal Heart Attacks, Minor Restricted Activity Days, Work Loss Days, Incidence Lung Cancer, Hospital Admittances for Cardio- Cerebro- and Peripheral Vascular Disease, Hospital Admittances for Alzheimer's Disease, Hospitalization Admittance for Parkinsons Disease, Incidence Stroke, Incidence Out of Hospital Cardiac Arrest, ER visits for All Cardiac Outcomes, and School Loss Days, All Cause. These health benefits are based on ozone and particulate matter reductions.

Table 12. Summary of the total annual health benefits (dollars, millions) associated with each renewable resource type by the CP Scenario and CCAP Scenario. Low and high estimates are provided. All values are in 2024 dollars.

		2035						2050					
		CP Scenario		CCAP Scenario		Added Benefit of CCAP Scenario over CP Scenario		CP Scenario		CCAP Scenario		Added Benefit of CCAP Scenario over CP Scenario	
County	Renewable Resource Type	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
All	Offshore Wind	12.05	14.68	14.50	17.60	2.45	2.92	19.89	24.18	34.21	41.30	14.32	17.12
All	Utility-Scale Solar PV	42.98	52.19	42.95	52.11	0.00	0.00	145.39	175.07	189.65	228.19	44.26	53.12
All	Distributed Solar PV	12.05	14.68	14.50	17.60	2.45	2.92	19.89	24.18	34.21	41.30	14.32	17.12
All	Total Solar PV	55.03	66.88	57.45	69.71	2.42	2.83	165.28	199.25	223.87	269.49	58.59	70.24
All	Total Renewable	67.08	81.56	71.95	87.31	4.87	5.75	185.17	223.43	258.08	310.78	72.91	87.35

Table 13. Summary of the total annual mortality associated with each renewable resource type by the CP Scenario and CCAP Scenario. Low and high estimates are provided. All values represent avoided illnesses.

		2035						2050					
		CP Scenario		CCAP Scenario		Added Benefit of CCAP Scenario over CP Scenario		CP Scenario		CCAP Scenario		Added Benefit of CCAP Scenario over CP Scenario	
County	Renewable Resource Type	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
All	Offshore Wind	0.62	0.77	0.75	0.93	0.13	0.16	0.86	1.07	1.48	1.82	0.62	0.75
All	Utility-Scale Solar PV	2.22	2.74	2.21	2.74	0.00	0.00	6.29	7.71	8.20	10.04	1.91	2.33
All	Distributed Solar PV	0.62	0.77	0.75	0.93	0.13	0.16	0.86	1.07	1.48	1.82	0.62	0.75
All	Total Solar PV	2.84	3.52	2.96	3.67	0.12	0.15	7.15	8.77	9.68	11.86	2.53	3.09
All	Total Renewable	3.46	4.29	3.71	4.59	0.25	0.30	8.01	9.84	11.16	13.68	3.15	3.84

Table 14. Summary of the total annual mortality (dollars, millions) associated with each renewable resource type by the CP Scenario and CCAP Scenario. Low and high estimates are provided. All values are in 2024 dollars.

		2035						2050					
		CP Scenario		CCAP Scenario		Added Benefit of CCAP Scenario over CP Scenario		CP Scenario		CCAP Scenario		Added Benefit of CCAP Scenario over CP Scenario	
County	Renewable Resource Type	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate	Low Estimate	High Estimate
All	Offshore Wind	10.81	13.44	13.00	16.10	2.19	2.66	18.00	22.29	30.93	38.01	12.93	15.72
All	Utility-Scale Solar PV	38.54	47.76	38.51	47.67	0.00	0.00	131.39	161.06	171.36	209.90	39.97	48.84
All	Distributed Solar PV	10.81	13.44	13.00	16.10	2.19	2.66	18.00	22.29	30.93	38.01	12.93	15.72
All	Total Solar PV	49.35	61.20	51.51	63.77	2.16	2.57	149.38	183.35	202.28	247.91	52.90	64.56
All	Total Renewable	60.17	74.64	64.51	79.88	4.34	5.24	167.38	205.64	233.21	285.91	65.83	80.27

D. County Demographics

Introduction

Public health data is essential for identifying communities at greatest risk from climate-related health impacts. By tracking patterns in environmental exposures, chronic disease, and social vulnerability, public health data allows us to pinpoint “hot spots” where people face greater risks to their health and well-being. This information is critical for directing resources, guiding adaptation strategies, and improving health outcomes for the most vulnerable populations.

For this section of the report, the following resources were used:

- Headwater Economics – basic demographic information from ACS 5-year estimates 2019-2023 (<https://headwaterseconomics.org/apps/economic-profile-system>)
- NJ Health Adapt – Countywide Reports (<https://njhealthadapt.rutgers.edu/>)
- New Jersey’s County and City Hazard Mitigation Plans

NJ Public Health Adapt is developed by Rutgers to support efforts at the state, regional, and local levels to understand the impacts that changing climate conditions may have on public health, as well as to support efforts to adapt to changing climate conditions in ways that improve health outcomes, especially for those populations experiencing climate-related health disparities. This report section focuses on two primary reports listed below.

The **Environmental Conditions/Exposures Associated with Negative Health Outcomes Potentially Exacerbated by Climate Change** report provides a comprehensive overview of how environmental stressors intersect with public health risks across New Jersey. It examines a range of factors—including air quality degradation, urban heat island effects, and the flood exposure of facilities that store hazardous materials—to illustrate how climate change can intensify existing vulnerabilities. This report underscores the importance of integrating climate projections into public-health planning and points to the necessity for adaptive strategies that reduce exposure, enhance resilience, and build equity in health outcomes.

The other report referenced for the summaries below is the **Socio-demographic Factors at Greater Risk of Negative Health Outcomes from Climate Change** report. While the health of all people living in the United States is affected by climate change, some communities and some populations are more vulnerable to changing climate conditions than others. Populations of concern include those with low income, communities of color, immigrant groups, Indigenous peoples, children and pregnant women, older adults, outdoor laborers, persons with disabilities, and persons with preexisting or chronic medical conditions. Poverty, lack of access to transportation, limited English proficiency, and crowded or substandard housing may weaken an individual's ability to adapt to a changing climate. Existing societal inequities also impede the ability of an individual or community to respond to climate change. These inequities may include unequal access to social, community-based, and economic opportunities that enhance health and well-being, disproportionate exposure to environmental hazards, and social isolation.

The most recent county and municipal Hazard Mitigation Plans (HMP) are used to highlight the top hazards of concern for each county. Every HMP is required to include county level profiles of each hazard that can impact a county. Counties and municipalities are required to assess the possible impacts of hazards on their communities as well as hazard mitigation actions to mitigate those hazards. Actions provided in each HMP therefore have community buy-in due to community engagement requirements during the HMP drafting and updating process. Top hazards of concern are only for awareness purposes in this report and have been filtered to include those relevant to the CCAP process: readers are encouraged to refer to the relevant county and municipal HMPs for additional details (municipal HMPs are typically included as annexes to each county HMP).

The purpose of this section is to provide an overview of the populations most at risk within the New Jersey, and therefore the most likely to benefit from the implementation of GHG Reduction Measures in the state. Rutgers selected the 11 counties with the greatest number of vulnerable populations consistent with EJMAP which are summarized below.

Summaries by County

Atlantic County

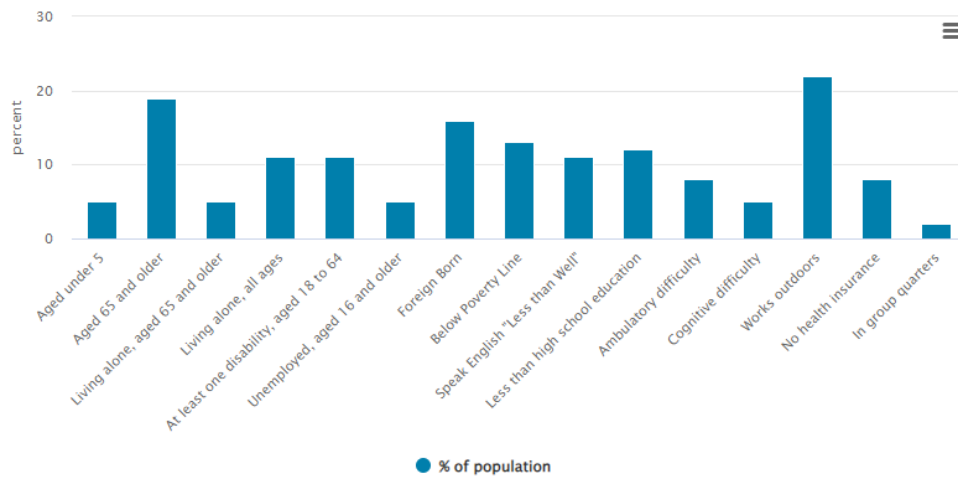
Relevant Top Hazards of Concern: severe weather, flood, wildfire ([Atlantic HMP 2022](#))

County Summary: Atlantic County has a population of 274,704, reflecting a slight increase of 0.6% since 2010. The median age for the County has also increased from 39.4 in 2010 to 42.2 in 2023, in accordance with the overall aging trend for the State.

In terms of transportation, the County ranks 16th among New Jersey's 21 counties for the average daily combined number of cars, light trucks, and heavy trucks. Its annual mean fine particulate matter 2.5 concentration is $7.13 \mu\text{g}/\text{m}^3$ (based on 2019 data) which is below the US EPA standard of $9.0 \mu\text{g}/\text{m}^3$. Fine particulate matter 2.5 (PM_{2.5}) refers to the tiny particles that create larger bodies of pollution. PM_{2.5} particles are small enough to travel deep into the body, accumulating in the lungs and increasing the risk of respiratory and cardiovascular diseases. The county also experiences urban heat island effects mostly around Atlantic City, where developed areas become significantly hotter due to reduced green space, increasing heat-related illnesses. Environmental hazards also pose significant concerns: the County has 495 known contaminated sites and 170 restricted wells, more than half of which are in flood-prone areas—posing risks for residents and workers nearby.

The demographic makeup of Atlantic County consists of notable proportions of vulnerable groups: 19% aged 65+, 13% living below the poverty line, 11% with limited English, 8% without health insurance, and 22% working outdoors. The complete demographic profile is presented in the graph below.

General Proportional Demographics 2022



The household data reveal that 55% of homes were built before 1980, 32% were renter-occupied, and 12% lacked a vehicle, all of which may compound climate vulnerability.

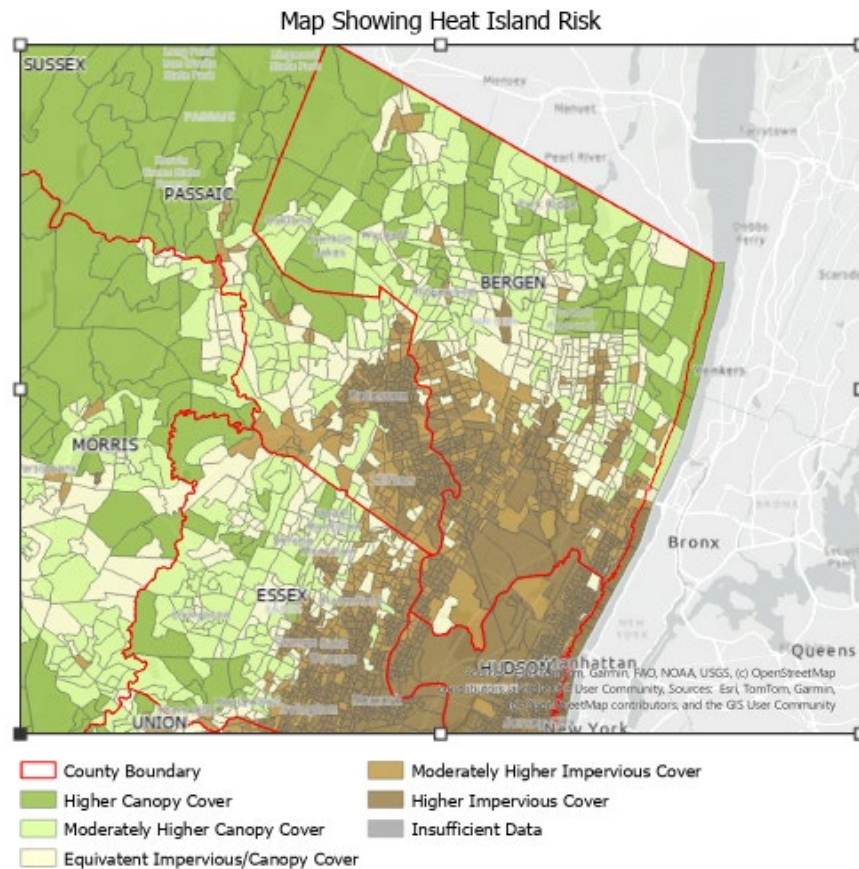
Bergen County

Relevant Top Hazards of Concern: severe weather, flood, wildfire ([Bergen HMP 2021](#))

County Summary: Bergen County is New Jersey's most populous county, with 954,717 residents, and has experienced a 6.5% population increase since 2010. In line with the upward aging trend of NJ, Bergen County saw an increase in median age from 40.8 to 42.1 from 2010 to 2023.

Along with being the most populous county, Bergen County also experiences extreme air pollution. Bergen County ranks 5th among NJ Counties in the average daily combined number of cars, light trucks, and heavy trucks, which accounts for high air pollution and bad air quality. Parts of the county experience up to 9 days per year of ozone levels (based on 2018 data) above the ozone standard of 0.070 ppm. It is also one of the few counties that is seeing an upward trend of annual mean fine particulate matter 2.5 concentration, which was reported to be 10.37 $\mu\text{g}/\text{m}^3$ in 2019 and is above the EPA recommended standard of 9.0 $\mu\text{g}/\text{m}^3$.

Bergen County is part of the New York metropolitan area, and its southern municipalities experience the heat island effect because dense development and extensive impervious surfaces hold more heat than green spaces. The map below shows the ratio of impervious cover to canopy cover. The green color shows higher proportion of tree canopy and the brown areas are the ones with higher impervious surfaces.



The demographic makeup of Bergen County consists of notable proportions of vulnerable groups: 18% aged 65+, 7% living below the poverty line, 15% with limited English, 7% without health insurance, and 15% working outdoors. The household data reveal that 75% of homes were built before 1980, 52% were built before 1960, 35% were renter-occupied, and 8% lacked a vehicle. These are the conditions that may compound climate vulnerability.

Burlington County

Relevant Top Hazards of Concern: disease outbreak, extreme temperature, flood, severe weather ([Burlington HMP 2024](#))

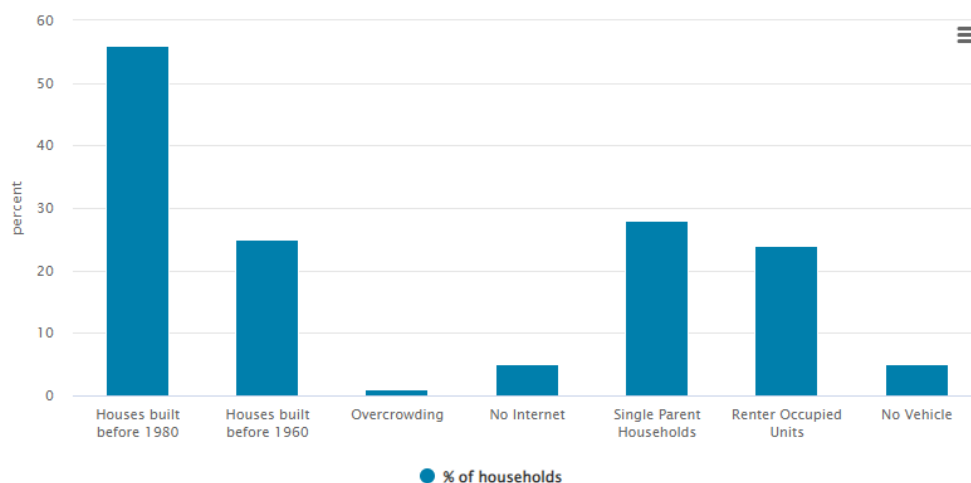
County Summary: Burlington County has a population of 464,226, reflecting a 3.7% increase since 2010. The median age has also risen from 39.6 to 41.7.

In terms of transportation, the County ranks 14th among New Jersey's 21 counties for average daily vehicle traffic, including cars, light trucks, and heavy trucks. Air quality remains a concern, as Burlington is one of the few counties showing an upward trend in the number of days per year exceeding the ozone standard of 0.070 ppm, with 9.33 days recorded in 2018. The county's annual mean fine particulate matter (PM_{2.5}) concentration is 9.23 µg/m³ (based on 2019 data) slightly exceeding the EPA standard.

Several towns along the Delaware River—including Burlington Township, Willingboro, Riverside, and Delran—experience notable urban heat island effects.

The demographic makeup of Burlington County highlights several vulnerable populations: 18% of residents are aged 65 or older, 7% live below the poverty line, and 18% work in outdoor occupations. Housing conditions further contribute to climate vulnerability, with 56% of homes built before 1980, 25% before 1960, 24% renter-occupied, and 5% of households lacking a vehicle. A breakup of the vulnerable population groups is presented below.

Household Proportional Demographics 2022



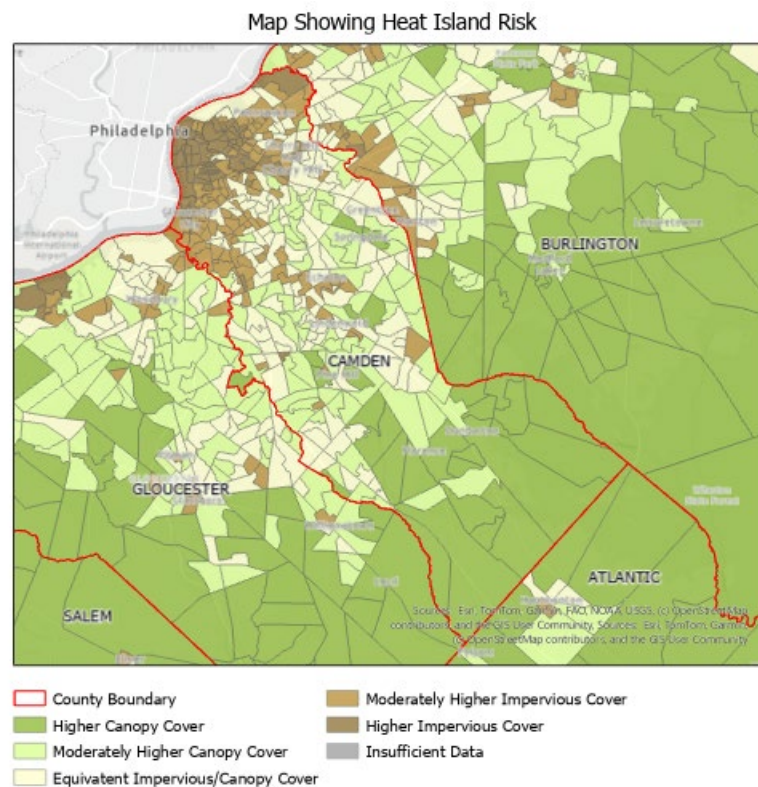
Camden County

Relevant Top Hazards of Concern: severe summer and winter weather, extreme temperatures, disease outbreak, flood ([Camden HMP 2021](#))

County Summary: Camden County has a population of 524,042, reflecting 2% growth since 2010. The median age has increased from 37.2 to 38.8.

The county ranks 7th among New Jersey's 21 counties in average daily vehicle traffic, including cars, light trucks, and heavy trucks. This contributes to elevated air pollution and poor air quality. Parts of the county experience up to eight days per year (based on 2018 data) with ozone levels above the standard of 0.070 ppm. Camden is also among the few counties showing an upward trend in annual mean fine particulate matter (PM_{2.5}) concentration, reported at 10.83 µg/m³ in 2019 which is above the EPA recommended standard of 9.0 µg/m³.

Many towns along the Delaware River—including Camden City, Gloucester, Pennsauken, and Cherry Hill—are significantly affected by the urban heat island effect as shown in the map below.



The demographic profile of Camden County reveals several vulnerable groups: 16% of residents are 65 or older, 12% live below the poverty line, 9% have limited English proficiency, 7% lack health insurance, and 22% work in outdoor occupations. Housing data further underscore vulnerability: 72% of homes were built before 1980, 41% before 1960, 35% are renter-occupied, and 11% of households lack a vehicle. These conditions compound the county's overall climate risk.

Cumberland County

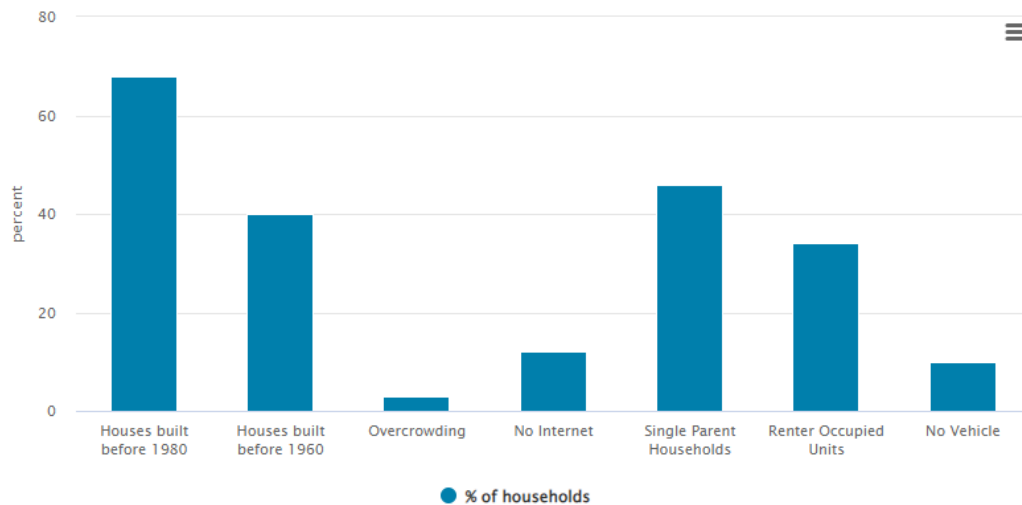
Relevant Top Hazards of Concern: severe summer and winter weather, flood, wildfire
([Cumberland HMP 2022](#))

County Summary: Cumberland County has a population of 152,915 and is one of the few New Jersey counties to experience a population decline, with a 1.6% decrease since 2010. The median age has risen from 36.5 to 37.6, following the statewide trend of an aging population.

Located along the Delaware Bay, the county has a rural landscape and does not experience heavy traffic. The annual mean fine particulate matter (PM_{2.5}) concentration was 8.27 µg/m³ in 2019—within the current U.S. EPA standard.

It is the social and housing characteristics in Cumberland County that contribute significantly to its climate and public health vulnerability. The population includes 16% aged 65 or older, 16% living below the poverty line, 13% with limited English proficiency, 10% without health insurance, and 34% employed in outdoor occupations. Housing conditions add to this risk, with 68% of homes built before 1980, 40% before 1960, 34% renter-occupied, and 10% of households lacking a vehicle. A breakup of the vulnerable population groups is presented below.

Household Proportional Demographics 2022



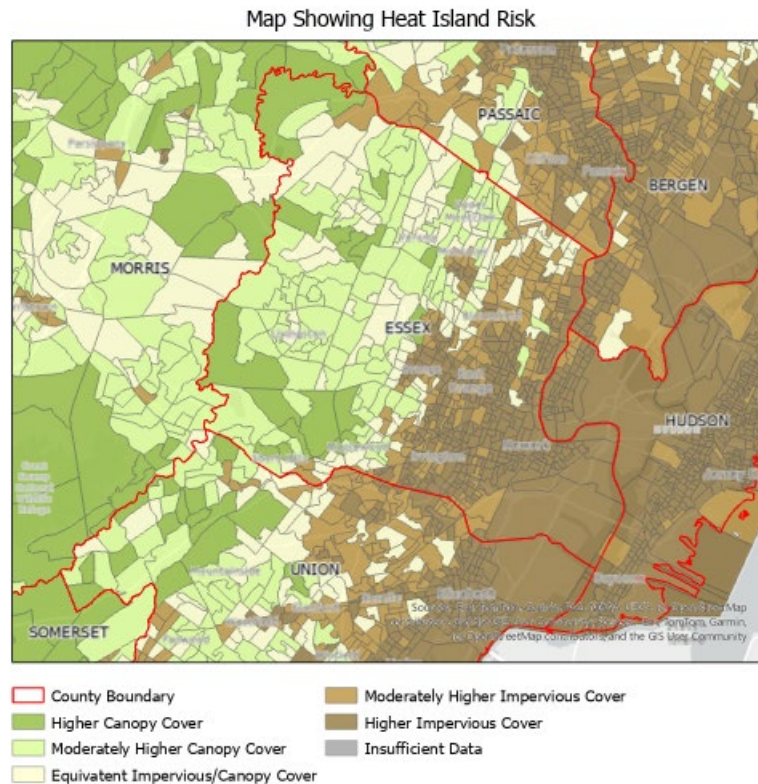
Essex County

Relevant Top Hazards of Concern: severe weather, flood, wildfire, extreme temperatures ([Essex HMP 2025](#))

County Summary: Essex County has a population of 854,130, reflecting 9.4% growth since 2010. The median age has increased from 36.0 to 37.7.

As part of the New York metropolitan area, Essex includes Newark—New Jersey’s most populous city. The county ranks 3rd among New Jersey’s 21 counties in average daily vehicle traffic, including cars, light trucks, and heavy trucks. Higher traffic volumes increase exposure to tailpipe emissions and degrade air quality—particularly when combined with elevated temperatures—leading to negative health outcomes such as higher rates of asthma and other respiratory illnesses. In 2019, the annual mean fine particulate matter (PM_{2.5}) concentration was reported at 8.77 µg/m³ which is very close to the EPA standard of 9.0 µg/m³.

The county also experiences very high urban heat island impacts, especially in cities such as Newark, East Orange, Bloomfield, and Irvington, due to extensive impervious cover and dense urban development as shown in the map below



The demographic profile of Essex County underscores its social vulnerability: 14% of residents are aged 65 or older, 15% live below the poverty line, 15% have limited English proficiency, 12% lack health insurance, and 24% work in outdoor occupations. Housing conditions further compound climate risk, with 76% of homes built before 1980, 54% before 1960, 55% renter-occupied, and 21% of households without a vehicle.

Gloucester County

Relevant Top Hazards of Concern: severe weather, flood, extreme temperatures, utility failure ([Gloucester HMP 2022](#))

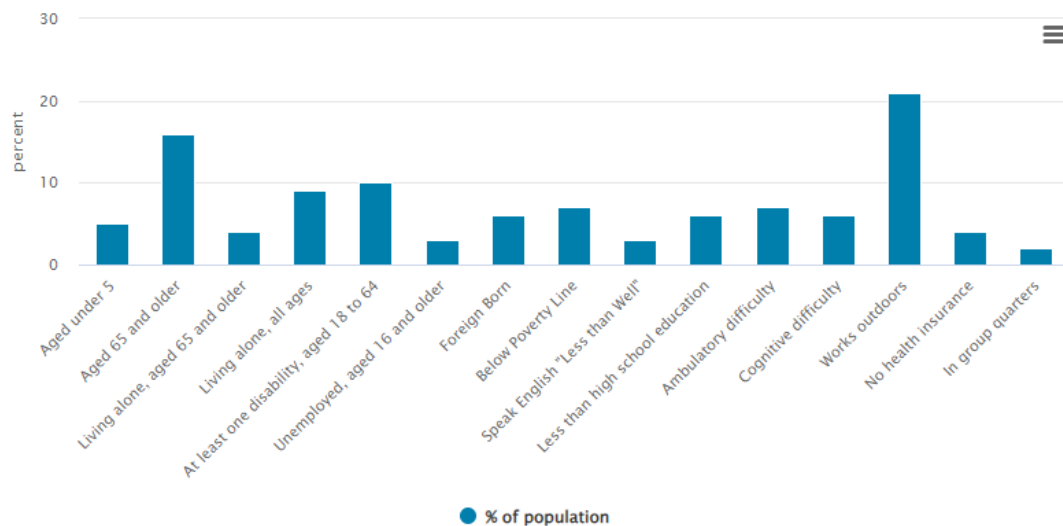
County Summary: Gloucester County has a population of 304,504, reflecting a 6.8% increase since 2010. The median age has risen from 38.2 to 40.1.

In terms of transportation, the county ranks 12th among New Jersey's 21 counties for average daily vehicle traffic, including cars, light trucks, and heavy trucks. The annual mean fine particulate matter (PM_{2.5}) concentration was 7.87 µg/m³ in 2019. Gloucester is also one of the few counties showing an upward trend in the number of days exceeding the ozone standard of 0.070 ppm, with 6.67 days reported in 2019.

Several towns near neighboring Camden County—including West Deptford, Woodbury, and Paulsboro—experience notable urban heat island effects.

The demographic profile of Gloucester County highlights several vulnerable populations: 16% of residents are aged 65 or older, 7% live below the poverty line, 3% have limited English proficiency, 4% lack health insurance, and 21% work in outdoor occupations. The complete demographic profile is presented in the graph below.

General Proportional Demographics 2022



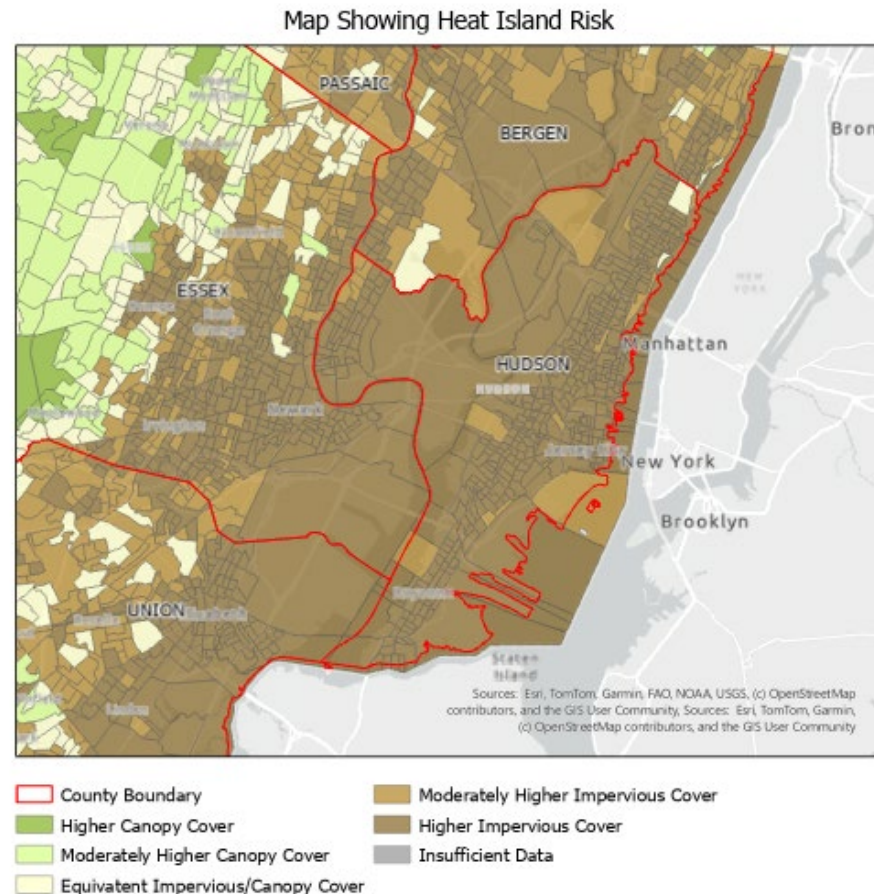
Housing conditions also contribute to climate vulnerability, with 52% of homes built before 1980, 26% before 1960, 20% renter-occupied, and 5% of households without a vehicle.

Hudson County

Relevant Top Hazards of Concern: severe weather, flood, extreme temperatures ([Hudson HMP 2025](#))

County Summary: Hudson County has a population of 710,478, reflecting a 14.2% increase since 2010. The median age has risen from 34.1 to 35.8, in line with New Jersey's overall aging trend.

The county ranks the highest among New Jersey's 21 counties in average daily vehicle traffic, including cars, light trucks, and heavy trucks. This contributes to high levels of air pollution and poor air quality. Parts of the county experience up to 4.67 days per year (based on 2018 data) with ozone levels above the standard of 0.070 ppm. In 2019, the annual mean fine particulate matter (PM_{2.5}) concentration was 9.37 µg/m³— which is slightly above the EPA's standard.



As part of the New York metropolitan area, Hudson County experiences a pronounced urban heat island effect. Dense development, extensive impervious surfaces, and limited green space result in higher localized temperatures across the county. The map below shows that the entire county has very high impervious cover.

The demographic profile of Hudson County underscores its social vulnerability: 12% of residents are 65 or older, 14% live below the poverty line, 22% have limited English proficiency, 12% lack health insurance, and 21% work in outdoor occupations. Housing conditions further compound climate risk, with 65% of homes built before 1980, 46% before 1960, 68% renter-occupied, and 33% of households without a vehicle.

Mercer County

Relevant Top Hazards of Concern: severe weather, flood, hazardous materials, disease outbreak ([Mercer HMP 2021](#))

County Summary: Mercer County has a population of 383,286, reflecting a 5.2% increase since 2010. The median age has risen from 37.4 to 39.2.

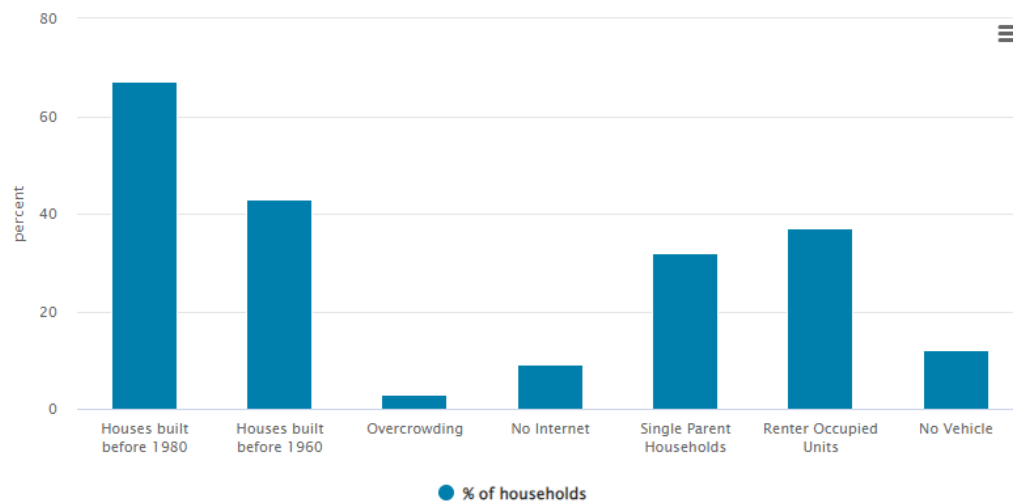
The county ranks 6th among New Jersey's 21 counties in average daily vehicle traffic, including cars, light trucks, and heavy trucks. This contributes to elevated air pollution and poor air quality.

Parts of the county experience up to eight days per year (based on 2018 data) with ozone levels above the standard of 0.070 ppm. In 2019, the annual mean fine particulate matter (PM_{2.5}) concentration was 7.83 µg/m³.

Urban heat island effects are notable in parts of the county, particularly in and around Trenton, where dense development and impervious surfaces amplify localized temperatures.

The demographic profile of Mercer County highlights several vulnerable populations: 16% of residents are aged 65 or older, 11% live below the poverty line, 13% have limited English proficiency, 7% lack health insurance, and 20% work in outdoor occupations. Housing conditions also add to climate risk, with 67% of homes built before 1980, 43% before 1960, 37% renter-occupied, and 12% of households without a vehicle. A breakup of the vulnerable population groups is presented below.

Household Proportional Demographics 2022



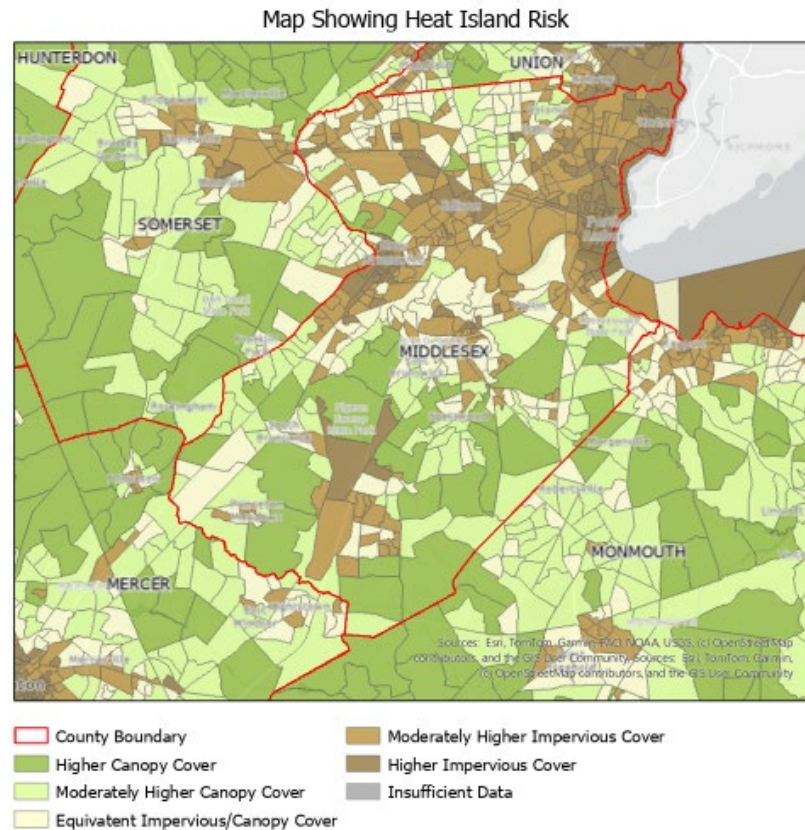
Middlesex County

Relevant Top Hazards of Concern: severe weather, flood, hazardous materials, extremely low/high temperatures ([Middlesex HMP 2022](#))

County Summary: Middlesex County has a population of 861,535, reflecting a 7.8% increase since 2010. The median age has risen from 36.9 to 39.4.

The county ranks 6th among New Jersey's 21 counties in average daily vehicle traffic, including cars, light trucks, and heavy trucks. This contributes to elevated air pollution and degraded air quality. Parts of the county experience up to eight days per year (based on 2018 data) with ozone levels above the standard of 0.070 ppm. In 2019, the annual mean fine particulate matter (PM_{2.5}) concentration was 8.13 µg/m³.

Urban heat island effects are most pronounced in the northern parts of the county, including Woodbridge, Edison, South Plainfield, and New Brunswick, where dense development and impervious surfaces drive higher localized temperatures. This information is presented in the map below.



The demographic profile of Middlesex County underscores its social vulnerability: 15% of residents are 65 or older, 8% live below the poverty line, 16% have limited English proficiency, 7% lack health insurance, and 20% work in outdoor occupations. Housing conditions further add to climate risk, with 59% of homes built before 1980, 32% before 1960, 36% renter-occupied, and 8% of households without a vehicle.

Union County

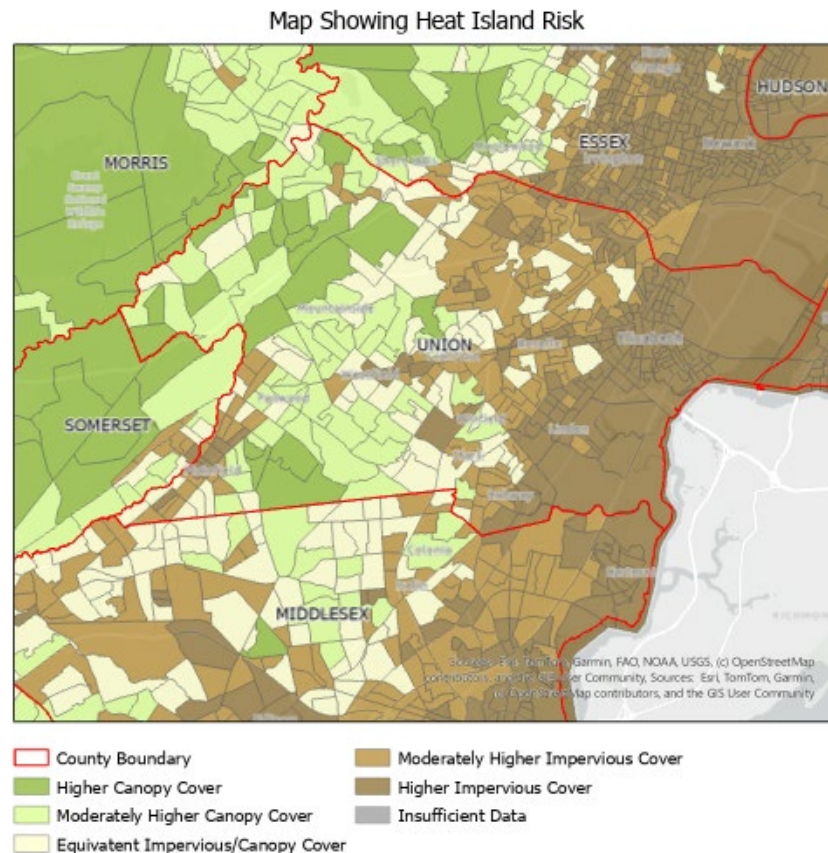
Relevant Top Hazards of Concern: hazardous materials release (fixed sites and transportation), storms, extreme cold and hot temperatures ([Union HMP 2021](#))

County Summary: Union County has a population of 572,549, reflecting an 8.1% increase since 2010. The median age has risen from 37.8 to 39.1.

The county ranks second highest among New Jersey's 21 counties in average daily vehicle traffic, including cars, light trucks, and heavy trucks. This contributes to elevated air pollution and

degraded air quality. Parts of the county experience up to four days per year (based on 2018 data) with ozone levels above the standard of 0.070 ppm. In 2019, the annual mean fine particulate matter (PM_{2.5}) concentration was 10.57 µg/m³ which is above the EPA standard of 9.0 µg/m³.

Urban heat island effects are most pronounced in the eastern part of the county, along the border with New York, where dense development and extensive impervious surfaces increase localized temperatures as shown in the map below.



The demographic profile of Union County highlights several vulnerable populations: 15% of residents are 65 or older, 9% live below the poverty line, 21% have limited English proficiency, 12% lack health insurance, and 25% work in outdoor occupations. Housing conditions further compound climate risk, with 80% of homes built before 1980, 59% before 1960, 42% renter-occupied, and 11% of households without a vehicle.

SECTION 3. SUMMARY of ADDITIONAL BENEFITS and POSSIBLE DISBENEFITS of GHG REDUCTION MEASURES to the FULL POPULATION

A team at Rutgers, the State University of New Jersey's Bloustein School of Planning and Public Policy conducted the community benefits analysis regarding the New Jersey GHG reduction measures. This analysis highlights the benefits associated with New Jersey's GHG reduction measures through the impacts of reduced GHG emissions and co-pollutant (e.g., PM_{2.5}, NO_x and NO₂, SO₂, VOCs, air toxics) emissions ([Section 2](#)). GHG reduction measures in New Jersey will have a positive impact on human health as well as other co-benefits including decreased energy costs and increased energy security, increased resilience and enhanced climate adaptation, greater access to climate smart transportation alternatives, improved housing quality (e.g., energy efficiency), enhanced community green space, workforce development opportunities, and improved quality of life (e.g., noise reduction). In some cases, these GHG reduction measures may create disbenefits within New Jersey communities. Bringing these disbenefits to the fore is important to ensure GHG Mitigation Measures are implemented with the greatest net benefit to the full population of New Jersey.

The purpose of this section of the community benefits analysis is to identify the additional benefits (i.e., benefits not discussed in [Section 2](#) and additional qualitative information regarding benefits discussed in [Section 2](#)) and the unintentional disbenefits for each proposed GHG Reduction Measure. Where possible this section includes recommendations regarding how to overcome and/or mitigate those disbenefits. Measures within the following eight industries are included:

- A. Electric Generation and Demand
- B. Transportation
- C. Residential and Commercial Buildings
- D. Industrial
- E. Waste and Agriculture
- F. Natural Gas Transmission and Distribution
- G. Halogenated Gases
- H. Natural and Working Lands – Carbon Sequestration

Below is a summary of the GHG reduction measures' impact on New Jersey Communities (Table 15). The table provides an overview of the benefits and disbenefits associated with each measure, and assigns each CCAP measure with a low, medium, and high ranking where "high" indicates a measure with a high positive impact on the full population of New Jersey. A high ranking was generally assigned to measures with (1) broad benefits that are also necessary to build infrastructure that could support other measures and/or (2) implications to a large percentage of the population in New Jersey (i.e., had impacts over a wide geographic area or had impacts on more than one group of people). [Subsections A through H](#) of this section provided detailed insights regarding the GHG Reduction Measures in the following categories: [Electricity Generation and Demand](#), [Transportation](#), [Residential and Commercial Buildings](#), [Industry](#), [Waste and Agriculture](#), [Natural Gas Transmission and Distribution](#), [Halogenated Gases](#), and [Natural and Working Lands – Carbon Sequestration](#).

Table 15. Summary table of the impacts, benefits, and disbenefits associated with the eight sectors and each respective GHG Reduction Measure. Rankings indicate the level of positive impact a measure may have on the full population of New Jersey. Each measure below is dependent on the implementation of enabling actions to achieve the measure.

	GHG Reduction Measure	Summary of Impacts	Impact Ranking for Full Population
Electric Generation and Demand Sector			
1	Codify the 100% Clean Electricity Standard	+ Physical health/improved air quality + Increased resilience + Improved Energy Security + Workforce Development - Physical health/improperly recycling batteries - Household expense of implementing measure.	High – This measure ensures 100% of retail electricity sales will be met by generation from zero-carbon resources which has positive impacts for all populations in New Jersey.
2	Reduce peak demand through adoption of progressive electricity rate designs and flexible loads	+ Physical health/improved air quality - Unequal Distribution of Environmental Benefits - Mental Health issues	High – This measure would require EV off-peak charge management and building heat pump usage, installing smart meters, smart thermostats, and implementing virtual power plants (VPP) to coordinate connected resources.
3	Support the development of 9GW of distributed solar and 19.6 GW of utility scale solar by 2050	+ Physical health/improved air quality + Workforce Development + Mental Health + Improved Energy Security - Physical health/unsustainable manufacturing and transport of materials - Community beautification - Decreased financial security - Non-accessible programing	High - This measure would increase the amount of solar energy accessible to industry (via the Competitive Solar Incentive program and Dual Use Solar program), state and local government facilities, and residential communities.
4	Continue to participate in RGGI program.	+ Physical health/improved air quality + Workforce Development + Mental Health + Improved Energy Security - Physical health/unsustainable manufacturing and transport of materials - Community beautification - Decreased financial security - Non-accessible programing	High – This measure would follow the Strategic Funding Plans which identifies how the Regional Greenhouse Gas Initiative (RGGI) auction proceeds will be distributed among the NJDEP, NJ Board of Public Utilities, and the NJ Economic Development Authority.
5	Continue to support the development of 11GW of offshore wind by 2040	+ Physical health/improved air quality + Workforce Development + Mental Health + Improved Energy Security - Physical health/unsustainable manufacturing and transport of materials - Community beautification - Decreased financial security - Non-accessible programing	High – This measure would add 11GW of offshore wind power generation by 2040.

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6	Support the development of 2GW of new nuclear energy generation sources by 2050.	+ Physical health/improved air quality + Workforce Development + Improved Community Financial Security + Improved National Security - Physical health/improperly managed nuclear material and waste - Land Use	High – This measure would add at least 2GW of new nuclear power generation by 2040. This may take the form of small modular nuclear reactors or additional reactor(s) with generation capacity similar to existing units.
7	Support the deployment of 22 GW of battery storage by 2050.	+ Physical health/improved air quality + Increased resilience + Improved Energy Security + Workforce Development - Physical health/improperly recycling batteries - Household expense of implementing measure.	High – This measure would add at least 22GW of battery storage capacity by 2040 - NJ can accomplish this through continuation and expansion of existing storage incentives as well as pursuing investments in new grid-scale battery storage.
8	Invest in the development of 7GW of additional clean firm capacity (beyond what is listed above)	+ Physical health/improved air quality and reduced noise pollution + Workforce Development - Physical health/improper transport or use of materials - Economic stress	High – This measure would add 7GW of clean energy through a combination of technologies such as - long duration battery storage; new nuclear; hydrogen utilization in fuel cells; hydrogen or renewable natural gas utilization in combustion-based resources (e.g. combustion turbines, CTs, or combined cycle gas turbines, CCGTs); and other technologies,

Transportation Sector

1	Implement a GHG reduction planning standard for state and Metropolitan Planning Organization (MPO) transportation plans to reduce statewide light-duty vehicle miles travelled (VMT) 3% by 2050.	+ Physical health/improved air quality + Mental Health + Workforce Development - Physical health/pedestrians near streets, poor air quality and accident risk - Inequity in eMobility access and resources	High - This measure would require state and MPO transportation plans to assess and mitigate their GHG emissions impact to reach GHG reduction targets, including VMT, by a near-term target year. It advances public transit, telework, bike and pedestrian infrastructure; transit-oriented development; and more.
2	Implement large-scale public transit projects to reduce statewide light-duty VMT	+ Physical health/improved air quality + Mental Health + Workforce Development - Physical health/pedestrians near streets, poor air quality and accident risk - Inequity in eMobility access and resources	High - This measure would fund all levels of planning and implementation of large-scale transit projects to transfer the largest numbers of trips from driving to transit by connecting residential hubs with commercial and recreational hubs across the state. Include projects such as The Secaucus Meadowlands Transitway and South Jersey Bus Rapid Transit (BRT). Implement last-mile solutions to transit hubs.
3	Explore new pricing and other transportation alternatives that reduce VMT and emissions	+ Physical health/improved air quality + Mental Health + Workforce Development	High – This measure would develop and implement alternative for gas tax, such as distance-based user fees, VMT

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		- Physical health/pedestrians near streets, poor air quality and accident risk - Inequity in eMobility access and resources	fees, etc. and other travel demand management which may include congestion pricing, parking cash-out (PCO) and car-free tax incentives.
4	Implement all current policies and expand current transportation electrification programs.	+ Physical health/improved air quality + Mental Health + Public Safety + Workforce Development + Increased financial security + housing quality + climate resilience + energy security + noise reduction - Physical health/pedestrian injury - Financial uncertainty	High – This measure would ensure NJ continues Advanced Clean Cars Program (ACC) implementation and incentivize rapid, widespread adoption of electric vehicles throughout the state. While the future of the Advanced Clean Cars 2 (ACCII) and Advanced Clean Trucks (ACT) programs are uncertain, New Jersey must maintain its commitments made under the EV Law and the Medium-and Heavy-Duty Memorandum of Understanding. These commitments work to support New Jersey's momentum towards the outcomes projected under ACCII and ACT.
Residential and Commercial Buildings Sector			
1	Accelerate heat pump installations	+ Physical health/improved air quality + Financial Security + Workforce Development - Physical health/air pollution - Quality of life (noise pollution, expense)	High – This measure would expand and modify NJ incentive structure to prioritize adoption of heat pumps in residential and commercial buildings. Revise rate structures to align with increased electrification from heat pump adoptions
2	Adopt a Clean Heat Standard	+ Physical health/improved air quality + Mental Health + Improved Energy Security - Physical health/air pollution - Quality of life (noise pollution, expense, overpromised benefits)	Medium – This measure would require gas and delivered fuel utilities to reduce the emissions associated with the heating fuel they supply.
3	Upgrade building envelopes	+ Physical health/improved air quality + Mental Health + Improved Energy Security - Physical health/air pollution - Quality of life (noise pollution, expense, overpromised benefits)	High – This measure would implement various policies to retrofit 59% of existing residential and 72% of commercial buildings by 2050 and make 10% of low-to-moderate income properties electrification-ready.
4	Establish all-electric building codes	+ Physical health/improved air quality + Mental Health + Improved Energy Security - Physical health/air pollution - Quality of life (noise pollution, expense, overpromised benefits)	High – This measure would enact an all-electric building code that requires newly constructed buildings to have all-electric and energy efficient appliances and equipment that utilize either on-site or off-site renewable energy as its leading electricity source.
5	Adopt statewide Building Performance Standards	+ Physical health/improved air quality + Mental Health + Financial Security + Increased safety	Medium – This measure would, as an extension to the State's existing benchmarking program, update building performance

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		- Human Health - Increased Costs	standards to set energy efficiency standards for large commercial buildings greater than 25,000 square feet.
6	Adopt Zero Emissions Standards for space and water heating	+ Physical health/improved air quality + Mental Health + Financial Security + Increased safety - Human Health - Increased Costs	Medium – This measure would require manufacturers and contractors for residential and commercial buildings to meet emission standards for newly installed furnaces, boilers, and water heaters.
7	Lead by example by decarbonizing State, county and municipal resources	+ Physical health/improved air quality + Mental health + Financial Security + Improved Energy Security + Workforce Development - Physical health/air pollution - Quality of life (noise pollution, expense)	Medium – The measure would require all State government buildings to perform energy audits and implement energy efficiency and electrification measures to reduce their building's emissions.
Industry Sector			
1	Adopt manufacturing equipment efficiency standards and incentives for energy efficient technologies in manufacturing	+ Physical health/improved air quality + Reduced Energy Costs + Improved Housing Quality + Financial Security + Workforce Development - Environmental Health - Physical Health (exposure to improperly handled materials) - Reliability of Industrial Heat Pumps - Quality of Life (noise pollution, expense)	Medium - This measure would require manufacturers of new industrial furnaces and water heaters used in manufacturing to meet energy efficiency standards. Incentives would support installation of industrial heat pumps, thermal batteries, and other energy efficient technologies.
2	Implement a mandatory emissions reduction program for high-emitting sources in the industrial sector.	+ Physical health/improved air quality + Improved Environmental Health - Decreased services - Increased noise pollution	High – This measure would set a declining cap on emissions from sources that emit 24,000 MT/year or greater, to reduce emissions a specific percentage (25%) below baseline levels by 2050.
Waste and Agriculture Sector			
1	Adopt stricter rules for landfill caps and lower threshold for emission reporting and controls at landfills and wastewater treatment facilities (WWTFs).	+ Physical health/improved air quality - Safety Risks - Technology Lock-in	High – This measure would modify GHG Monitoring and Reporting (GHGMR) rule to expand controls on methane emissions from landfills and wastewater and explore using remote sensing technology to detect leaks and enforce compliance.
2	Expand regulatory requirements for food waste recycling and diversion	+ Physical health/improved air, soil, and water quality + Mental Health - Emissions - Physical Health (exposure to improperly handled materials) - Mental Health - Financial Resilience - Capacity to store food	Medium – This measure would expand requirements such as lowering the current food waste recycling regulatory threshold for large generators from 52 to 25 tons and requiring all food waste generating businesses in the state to reduce or divert some percentage of their annual food waste through a combination of reduction, donation, composting or sending to recycling facilities.
3	Apply compost to cropland and pasture	+ Physical health/improved air, soil, and water quality	Low - This measure would stand up and expand programs to support the application of

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		- Physical Health (exposure to improperly handled materials)	compost to cropland and pasture, with the goal of applying compost to 20,000 acres annually in 2050. This reduces methane emissions from landfills by diverting waste from decomposing in landfills (an anaerobic environment).
Natural Gas Transmission and Distribution Sector			
1	Implement a mandatory emissions reduction program for natural gas T&D systems	+ Physical health/improved air quality + Energy Security - Physical health/worker safety	Medium – This measure would enhance leak detection monitoring, require natural gas companies to improve on the response times for addressing leaks, and implement a mandatory emissions reduction program for natural gas T&D systems.
2	Stop the expansion of natural gas T&D infrastructure and introduce non-pipeline alternatives	+ Physical health/improved air quality + Financial Security + Workforce Development - Physical health/air pollution - Quality of life (noise pollution, expense, infrastructure disruptions) - Financial Security	High - This measure would implement incentives to convert portions of the natural gas systems to thermal energy networks and develop tools to help with building electrification plans, like a distribution hosting capacity map or gas system planning tools.
Halogenated Gases Sector			
1	Implement a refrigerant management program	+ Physical health/improved air quality + Workforce Development - Physical health/worker safety	Medium – This measure would require facilities with air conditioning chillers and/or refrigeration systems using 50 lbs or more of a high-GWP (150 GWP or more) refrigerant to conduct and report periodic leak inspections; promptly repair leaks; and adopt service practices to reduce emissions of refrigerants.
2	Implement a refrigerant replacement incentive program	+ Physical health/improved air quality + Workforce Development + Decreased Energy costs - Physical health/exposure to harmful materials	Medium – This measure would expand existing pilot incentive programs such as NJ Cool, to support businesses, institutions and local governments, especially those in low- and moderate-income communities, to upgrade their systems with low and ultra-low GWP refrigerants.
Natural and Working Lands – Carbon Sequestration			
1	Strengthen and expand existing natural carbon sinks through reforestation, afforestation, and restoration, to at least 10 MMT CO ₂ e/year.	+ Physical health/improved air and water quality + Mental Health + Mental Acuity + Increased resilience + Improved Energy Security + Infrastructure Protection	High - NJ will take a series of policies and actions that will maintain, restore and expand its natural and working lands that act as natural carbon sinks.

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		+ Workforce Development Opportunities - Installation and management costs - Physical Health (from illegal dumping, ecological changes) - Quality of life (noise pollution, expense, infrastructure disruptions)	These enabling actions may include: (1) create and expand statewide land acquisition programs that ensure conservation and low/negative carbon land uses (such as Blue Acres and Green Acres programs for acquisition of private land for conservation), (2) Implement policies and incentives to increase the ability of lands to offset GHGs and land management / sequestration of carbon, and more.
2	Protect, maintain, and avoid the conversion of natural lands, including 21,000 acres of forested lands, through high-carbon land acquisitions and policies that promote location-efficient development	+ Physical health/improved air and water quality + Mental Health + Mental Acuity + Increased resilience + Improved Energy Security + Infrastructure Protection + Workforce Development Opportunities - Installation and management costs - Physical Health (from illegal dumping, ecological changes) - Quality of life (noise pollution, expense, infrastructure disruptions)	High – This measure would create new or expand existing programs such as Green and Blue Acres to avoid the conversion of or acquire on average at least 840 acres of additional forested lands annually which may then be used as public parks, forests and wildlife areas that prevent them from being converted into non-forest, (higher emission) uses.

Additionally, stakeholder engagement in June 2025 yielded informative input from the public regarding the proposed GHG Reduction Measures. Feedback from these stakeholders, and the stakeholders who engaged in the 2024 PCAP, is included in the detailed tables and narrative in the remaining pages of Section 3 (Subsections A-H). General stakeholder feedback is provided below for reference. For a more detailed recording of stakeholder feedback, refer to Appendix G.

- Stakeholder Input on Education & Engagement
 - Need more educational outreach materials and communications about climate change coming directly from scientists
 - Need to translate materials and communications into multiple languages especially Spanish
 - Need more educational outreach around simple home energy efficiency practices for low-income households, especially in South Jersey EJ communities.
 - Desire educational webinars and simple 101 materials like “Your Planning and Zoning Boards: 101” for residents to understand local environmental decision-making processes and their local planning and zoning boards.
 - Educate more local planning and zoning departments about sustainable land use policies and practices
 - Need greater education around how to recycle plastics, hazardous waste, and eWaste materials
 - Lack knowledge, and need greater education about waste reduction practices and alternatives for consumers and businesses
 - Need greater communication about the status and progress of clean energy development projects such as community solar, offshore wind, and others.

- Stakeholder Input on Equitable Access to Clean, Affordable Energy
 - Need more home energy rebates and they need to be made larger
 - Rebates should make the switch to electric “actually affordable” for low- and moderate-income people.
 - Support expanding the Trenton Whole Homes pilot statewide
 - State should take actions to ensure renters can see the benefits from landlords making whole of home improvements for energy efficiency without hiking up rents after
 - State should prioritize undertaking the infrastructure upgrades needed to bring clean energy to certain communities – especially a problem in South Jersey where transmission is older and less expansive.
- Stakeholder Input on Land Use, Development, and Natural, Working Lands
 - The state should develop climate-smart land use planning criteria and mandate that planning boards and zoning boards evaluate land use applications based on criteria.
 - Reverse state policy that prevents Indigenous people (and other New Jerseyans) from foraging on the land
 - Need for more nurseries or expanded State tree nurseries as well as changes to current policies that restrict the sale of native fruit trees from NJ tree farms to non-commercial buyers.
 - Concerns around lack of oversight and regulatory enforcement of environmental harms to local air, water, and public health from large farming operations in South Jersey.
 - Removing legal restrictions and regulatory hurdles that prevent people from growing their own food, whether that be on community farms, on their lawns, or smaller-scale farms.
 - Increase access to capital for historically underrepresented groups to purchase land and become farmers and producers.
 - Desire for the State to reform brownfield redevelopment policies that currently disincentive infill development and/or place additional burdens on NJ OBCs, such as requirements around cleanup assessment fees and initial assessments.
 - • Desire for some state regulatory or legislative actions to limit [the ability of local planning boards to make exceptions to zoning ordinances] warehouse development approvals without extensive consideration of climate impacts especially in residential areas.
- Stakeholder Input on Transportation
 - Efforts to support and expand micromobility and eMobility while important, should not detract from the need to accelerate electrification – especially that of school and transit buses.
 - Deficit of public transit options and quality of service to South Jersey communities
 - Desire for expansion of public transit bus services to run later into the evening, add additional stops, and add real-time trip information technology to the app and at stops.
 - Support for public transit expansion projects in South Jersey including projects like the Glassboro-Camden light-rail, bus rapid transit (BRT), electrified Jitney services that would connect between, and reviving existing and legacy rail lines for passenger rail service.
 - Support for ‘complete streets’ funding and infrastructure projects that improve safety and accessibility for all transportation modes (pedestrians, bicyclists, and vehicles) with acknowledgment that bicycling may not be a feasible option for many South Jersey rural communities.
- Stakeholder Input on Workforce Development
 - Need a “one-stop-shop” of information on available training programs, apprenticeship and job opportunities for both job-seekers and trainers or career advisors

- Need to provide incentives to companies to hire residents from OBCs and under-represented groups
- Need to provide incentives for or require companies to pay for employee training and certification
- Desire a discussion between the NJ Department of Labor, union leaders, advocates, and other relevant NJ agencies (i.e. BPU, DEP etc.) to lay out and agree on practical steps to ensure just transition and equity in green career opportunities.
- Stakeholder Input on Waste and Incineration
 - Require businesses to implement waste reduction practices and alternatives, including using more recycled and reusable materials
 - Need to remove the ability for incinerators to receive renewable energy credits (RECs) and stop incentivizing them to bring in more trash to burn.
 - Need to expand and reduce regulatory barriers to small-scale, community composting.
 - Institute policies to incorporate composting into our recycling and disposal routines
- Stakeholder Input on Electric Generation
 - Need to still develop offshore wind and champion these and other renewable solutions over continuation of fossil fuels.
 - State should prioritize solar, wind and battery storage exclusively
 - Opposition to considering waste incineration 'clean energy' and support for stopping generating electricity from these sources in NJ.
 - Opposition to NJ pursuing additional nuclear energy, hydrogen and liquified natural gas as ways to reach clean energy and emissions goals

A. Electricity Generation and Demand Sector

A summary of information regarding each measure under this sector is provided in the table below. Details regarding the Benefits, Disbenefits, and Recommendations to Mitigate Disbenefits can be found below the table.

CCAP Measure	Description	Direct Impacts/Changes	Summary of Impacts
1. Codify the 100% Clean Electricity Standard	Codify the 100% Clean Electricity Standard - Pass legislation to codify a Clean Electricity Standard of 100% of retail electricity sales met by generation from zero-carbon resources by 2035	In 2023, natural gas and nuclear power fueled 91% of New Jersey's total electricity generation, with each energy source contributing 49% and 42% respectively. (EIA NJ Profile 2025). New Jersey consumes more electricity than it produces. (EIA NJ Profile 2025). New Jersey would need to transition the energy infrastructure to support a 100% zero-carbon resource to commercial and residential populations. Grid modernization consists of supporting distributed energy resource (DER) development, pursuing grid modernization to support additional demand being put on the grid due to increased building electrification and EV infrastructure, and increased energy storage. Grid modernization is an important step toward a strong grid that can handle increased electric demand and, subsequently, ensuring vulnerable communities can use solar arrays and adopt other energy efficiency actions to augment their energy supply costs.	+ Physical health/improved air quality + Increased resilience + Improved Energy Security + Workforce Development - Physical health/improperly recycling batteries - Household expense of implementing measure.
2. Reduce peak demand through adoption of progressive electricity rate designs and flexible loads	This would include the following strategies: making time-of-use/time-variable rates widely accessible; mandating by legislation or rule EV off-peak charge management and building heat pump usage, installing smart meters, smart thermostats, and implementing virtual power plants (VPP) to coordinate connected resources.	As of 2021, there were 999 peak demand fossil fuel-fired power plants (known as "peakers") in the United States that supplement other types of power plants and operate when power demand is greatest (e.g., hot summer afternoons) (GAO 2024). As of 2021, 70% of peakers used natural gas as the primary fuel type (GAO 2024). These peakers are traditionally located closer to economically vulnerable communities and urban communities (GAO 2024). Peakers emit less pollutants (e.g., sulfur dioxide, nitrogen oxides) in total because there are fewer peakers and they operate less frequently overall than non-peakers. However, when peakers do operate, they emit more pollution per unit of electricity produced (GAO 2024). Educating the public and creating mechanisms that reduce peak demand can have many positive health benefits.	+ Physical health/improved air quality - Unequal Distribution of Environmental Benefits - Mental Health issues
3. Support the development of 9GW of distributed solar and 19.6 GW of utility scale solar by 2050	Increase the amount of solar energy accessible to industry (via the Competitive Solar Incentive program and Dual Use Solar program), state and local government facilities, and residential communities.	Several of the programs or projects that could receive funding under this measure can generate solar energy for industry use, as opposed to solely residential use. This measure will have benefits to the populations' physical health, energy security, and workforce development.	+ Physical health/improved air quality + Workforce Development + Mental Health + Improved Energy Security - Physical health/unsustainable manufacturing and transport of materials - Community beautification

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			- Decreased financial security - Non-accessible programing
4. Continue to participate in RGGI program.	Follow the Strategic Funding Plans which identifies how the Regional Greenhouse Gas Initiative (RGGI) auction proceeds will be distributed among the NJDEP, NJ Board of Public Utilities, and the NJ Economic Development Authority.	The Regional Greenhouse Gas Initiative (RGGI) is a market-based program designed to reduce carbon dioxide (CO₂) emissions from the power sector. Launched in 2005, RGGI was the first multi-state program of its kind in the United States. RGGI is a cooperative effort among Connecticut, Delaware, Maine, Maryland, Massachusetts, New Hampshire, New Jersey, New York, Rhode Island, and Vermont. Electricity generators subject to these regulations comply by purchasing CO₂ allowances equal to the tons of CO₂ they emit. Allowances are purchased at regional quarterly auctions. States receive the proceeds from these auctions proportional to their contribution to the declining regional cap. Each participating state invests the auction proceeds into strategic programs to reduce greenhouse gases, mitigate climate change, and benefit stakeholders. Engaging in RGGI and projects funded by RGGI include but are not limited to reducing greenhouse gas emissions, creating job opportunities, reducing air pollutants, improving health outcomes and lowering healthcare costs, reducing costs to ratepayers and improving or restoring natural habitats. This could also include creating additional storage for DER and piloting vehicles' ability to support the grid (e.g., vehicle-to-everything ("V2X"), including vehicle-to-grid or V2G, vehicle-to-building or V2B, and vehicle-to-storage or V2S.	+ Physical health/improved air quality + Workforce Development + Mental Health + Improved Energy Security - Physical health/unsustainable manufacturing and transport of materials - Community beautification - Decreased financial security - Non-accessible programing
5. Continue to support the development of 11GW of offshore wind by 2040	Add 11GW of offshore wind power generation by 2040.	Increased offshore wind turbines and onshore infrastructure to support offshore wind (including a NJ wind port). The offshore wind industry in New Jersey is capable of generating renewable energy while also generating many jobs, which could provide excellent workforce development opportunities for economically vulnerable communities. However, steps must be taken to ensure the wind farm's offshore and onshore infrastructure do not have disproportionately adverse impacts to economically vulnerable communities. If disbenefits are avoided, the positive impact of this CCAP measure will increase.	+ Physical health/improved air quality + Workforce Development + Mental Health + Improved Energy Security - Physical health/unsustainable manufacturing and transport of materials - Community beautification - Decreased financial security - Non-accessible programing
6. Support the development of 2GW of new nuclear energy generation sources by 2050.	Add at least 2GW of new nuclear power generation by 2040. This may take the form of small modular nuclear reactors or additional reactor(s) with generation capacity similar to existing units.	The implementation of nuclear power in New Jersey communities would provide a highly reliable energy source with minimal human health impacts if the nuclear power is managed carefully and consistent with State, Federal, and international laws and regulations. The physical impact would be the construction of small modular nuclear reactors or other reactors and their infrastructure as well as management of nuclear waste.	+ Physical health/improved air quality + Workforce Development + Improved Community Financial Security + Improved National Security

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			- Physical health/improperly managed nuclear material and waste - Land Use
7. Support the deployment of 22 GW of battery storage by 2050.	Add at least 22GW of battery storage capacity by 2040 - NJ can accomplish this through continuation and expansion of existing storage incentives as well as pursuing investments in new grid-scale battery storage.	This measure would cause the manufacture of batteries that would then be installed and managed to support the grid as well as management of expired/used battery storage devices.	+ Physical health/improved air quality + Increased resilience + Improved Energy Security + Workforce Development - Physical health/improperly recycling batteries - Household expense of implementing measure.
8. Invest in the development of 7GW of additional clean firm capacity (beyond what is listed above)	Modeling shows that NJ will need up to 7GW of additional clean firm capacity to maintain system reliability in 2050. According to the EMP, NJ can accomplish this through the development of a combination of technologies such as long duration battery storage; new nuclear; hydrogen utilization in fuel cells; hydrogen or renewable natural gas utilization in combustion-based resources (e.g. combustion turbines, CTs, s or combined cycle gas turbines, CCGTs); and other technologies	This measure would result in the construction, installation, and management of new technology to support the grid.	+ Physical health/improved air quality and reduced noise pollution + Workforce Development - Physical health/improper transport or use of materials - Economic stress

Measure 1, 4, and 7: Creating an electric grid that can support 100% zero-carbon resources (including increased battery storage).**- Qualitative Benefits**

- Physical Health Benefits
 - Improved air quality from a “green” grid that does not rely predominantly on energy from fossil fuel-fired power plants.
- Increased Resilience
 - A grid that can support more DER, and has many sources of DER, makes the grid more resilient and less susceptible to brown outs during peak operating hours. (It could also support additional air conditioning units installed in OBC or AIOBC to improve their physical/mental health during extreme weather events).
 - Brownout prevention precludes the surge in crime, vehicle crashes, psychosocial stress, interruption of communication between emergency services, delivery of water, and waste removal that comes with brown outs ([Casey et al. 2020](#))
- Improved Energy Security
 - Going electric can save individuals energy cost and reduce their energy burden ([Kenny 2022](#)), particularly if financial incentives are applied ([Kocakusak et al. 2023](#)).
 - Lower energy bills can have mental health benefits, including stress reduction ([Brown et al. 2019](#))
- Workforce Development
 - If this action increases the number of installations of DER such as solar, then good paying jobs may be realized.

- **Qualitative Disbenefits**

○ Physical Health

- A “green” grid requires batteries to store energy so that energy can be supplied at a later time during regular operation and/or during power outages. However, there are some concerns regarding the safety of aged batteries, over/undercharged batteries, external/internal short circuits, vibration/shock, and rain/flood exposed batteries which can lead to batteries leaking, smoking, and possibly exploding, which can negatively impact human health ([Jeevarajan et al. 2022](#))
- Properly maintained batteries can have long lifespans, but ultimately are ideally recycled at the end of their lifespan to harvest precious rare earth metals and other materials ([Wan and Wang 2022](#)). Improperly recycled batteries can be harmful to human health and the environment ([Baumann et al. 2018](#); [Wan and Wang 2022](#)).

○ Expense

- Green energy can be expensive ([Adebayo and Alola 2023](#)) and households with high energy demands are less likely to purchase green electricity ([Fikru and Canfield 2024](#)).

- **Recommendations to Mitigate Disbenefits**

○ Physical Health

- Require the use of proper safety equipment: When proper safety equipment (*e.g.*, PPE) and better management protocols (*e.g.*, battery management systems, fire protection and suppression systems) are used, this greatly reduces the risk of human exposure/harm from battery degradation ([Jeevarajan et al. 2022](#))
- Require safe recycling of batteries: Follow recommendations of existing research ([Westlake et al. 2017](#); [Meegoda et al. 2024](#)), best practices ([EPA 2025](#)), and policy recommendations ([Ali et al. 2025](#))

○ Provide Financial Support Where Possible

- Provide financing and incentive programs that will help households improve their energy efficiency without causing unintended financial hardship.

Measure 2: Educating the public and creating mechanisms that mitigate peak demand.

See benefits for Measure 1 and below. There is overlap between this Measure 2 and the above Measure 1 because virtual power plants, highlighted in Measure 2, aggregate distributed energy resources which are discussed in Measure 1.

- **Qualitative Benefits**

○ Physical Health Benefits

- Short term exposure (*e.g.*, exposure periods from 1-minute to 1-month) to four key pollutants generated by fossil fuel fired-power plants (sulfur dioxide, nitrogen dioxide, particulate matter, and ozone) can cause negative health effects. All four pollutants contribute to poor respiratory function (*e.g.*, poor lung function, cough, chest tightness, and throat irritation). Particulate matter can cause cardiovascular effects (*e.g.*, heart attack, stroke, and changes in blood pressure) as well as mortality. Both particulate matter and ozone may contribute to negative metabolic effects (*e.g.*, changes in blood glucose level and inflammation) as well as negative nervous system effects (*e.g.*, brain inflammation and oxidative stress) ([EPA ISA 2015](#); [GAO 2024](#)).

- **Qualitative Disbenefits**

- Unequal Distribution of Environmental Benefits
 - External and internal factors influence an individual or community's engagement in pro-environmental behavior and their engagement in pro-environmental actions, even with education ([Kollmuss and Agyman 2010](#))
- Mental Health
 - Stakeholder Exhaustion or Fatigue – Continued engagement of stakeholders who engage in or are impacted by sustainability measures can result in stakeholder fatigue (a state of disengagement or apathy exhibited by individuals or groups, which can hinder the progress of environmental projects or initiatives ([Sustainability Directory 2025](#)))
 - Smart thermostats – using smart thermostats that do not provide transparency when temperatures automatically change can cause users to reassert their freedom and engage in reactance (a term used in psychology to describe a person's negative reaction to someone, or something, telling them what to do without an explanation)) ([Heatherly et al. 2023](#)).
- **Recommendations to Mitigate Disbenefits**
 - Equitable Public Outreach
 - Create standards and best practices for engaging the full breadth of communities to educate them on related opportunities. Existing best practice resources are available for reference ([Ground Work USA 2018](#)).
 - Mental Health
 - Smart thermostats – Users are more accepting of smart thermostats when the thermostats provide users with a brief explanation as to why temperatures are automatically changed possibly outside of the users' preferences. ([Heatherly et al. 2023](#)).

Measure 3, 4, and 5: Adding solar and wind power to the grid, and reducing GHG emissions in general.

- **Qualitative Benefits**
 - Workforce Development
 - If New Jersey generates 11 GW of offshore wind, the wind farms and accompanying infrastructure investments will result in job growth in the construction, manufacturing and professional services. In 2030, NJ was projected to see approximately 20,000 jobs related to offshore wind, both from in-state and regional demand ([BW Research Partnership 2022](#))
 - Physical Health
 - Improved air quality from a "green" grid that does not rely predominantly on energy from non-renewable sources.
 - Mental Health
 - Improved coastal amenities (e.g., port facilities) may improve individuals' connection with nature and access to marine facilities, but opinions are largely driven by individual perception of offshore wind ([Walker et al. 2014](#), [Hattam et al. 2015](#), [Glasson et al. 2022](#))
 - Improved Energy Security.
 - Solar power reduces energy costs for the owners of the solar panels or those participating in a community program.
 - Solar panels on agricultural land could provide financial support to NJ farmers ([Peretzman 2023](#)) as long as the solar panel locations do not block high quality farm land from being farmed ([Makhijani 2021](#)).
- **Qualitative Disbenefits**
 - Physical Health

- Effects on view and restorative nature of seascape could affect engagement with coastal communities and ultimately health ([Glasson et al. 2022](#))
- Manufacturing, transport, and installation of renewable energy resources can be cause environmental harm (solar: [Adekanmbi et al. 2024](#); wind: [Bosnjakovic et al. 2024](#))
- Community Beautification
 - Studies have shown wind farms located less than 40km from shore can result in housing price devaluation and tourist activity reduction which could affect the economic value of the region and resale values of homes. This could damage the financial security of homeowners ([Alem et al. 2020](#))
 - Overhead transmission lines and substation locations in communities can have a negative impact on property values.
- Decreased Financial Security
 - It is possible that wind farms could reduce fishermen's access to fishing grounds and/or have negative impacts on fisheries (Atlantic surfclam: [Scheld et al. 2022](#)), this could have a negative impact on fishermen. But additional research is needed to quantify those impacts ([Chaji and Werner 2023](#)).
- Roadblocks of Traditional Solar
 - Older homes may struggle to implement solar because it cannot support the weight of solar panels. A possible solution is community solar gardens (solar arrays are offsite but provide the same metering benefits as if panels were on homes). ([Fenton 2022](#))
 - Individuals who rent their homes would need landlords/apartment owners will need to be receptive to DERs for benefits to be realized. ([Miller and Chen 2019](#))
 - Complexity of incentive and subsidy programs can preclude public access to solar panels ([Fenton 2022](#); [Si and Stephens 2021](#))
- **Recommendations to Mitigate Disbenefits**
 - Create guidelines or thresholds for environmental degradation caused by the manufacturing and transport of renewable energy systems ([Gayen et al. 2023](#))
 - Engage in public education campaigns to educate full population on benefits of renewable energy resources and programs available to subsidize cost of installation of solar panels and other expensive infrastructure that could support a green grid.
 - Engage with Communities Impacted by Offshore Wind Development
 - Community engagement to inform the shape, position, and onshore elements of a wind farm are pivotal to a project's success, however community funds paid to community members (if implemented) can be viewed as bribes ([Glasson et al. 2022](#)).
 - Implement "good practice community engagement" as highlighted in Glasson et al. ([2022](#)).

Measure 6: Addition of either to the grid: (1) small modular nuclear reactors or (2) additional reactor(s) with generation capacity similar to existing units.

- **Qualitative Benefits**
 - Physical Health
 - Improved air quality from a "green" grid that does not rely predominantly on energy from fossil fuels.
 - Workforce Development/Job Creation

- Domestic nuclear power plants can employ up to 800 workers with salaries that are, on average, 27% higher than those of other generation sources. And building a nuclear reactor employs up to 9,000 workers during peak construction ([NEI 2024](#)). Moreover, periodic refueling outages at full-scale plants (once every 18 months in the case of Salem/Hope Creek, for each plant) bring large numbers of skilled craft workers to the facilities to conduct maintenance and assist in refueling operations. 100s of workers are generally on site for several weeks.
 - If this action increases the number of DER installation such as solar, good paying jobs may be realized.
 - Support Local Economies
 - Nuclear power plants generate billions of dollars annually to local economies through federal and state tax revenues ([USDOE 2024](#))
 - Supports National Security
 - A strong US nuclear sector allows the US to maintain its global leadership and promote peaceful use of nuclear technologies globally ([USDOE 2024](#)). New Jersey engaging in the nuclear sector provides additional opportunities to build relationships and develop new opportunities for peaceful nuclear power.
- **Qualitative Disbenefits**
 - Physical Health
 - Nuclear Reactors
 - Studies of past nuclear energy accidents and incidents estimate that with 388 reactors in operation globally, there is a 50% chance that a Fukushima event (or more costly) will occur every 60-150 years ([Wheatley et al. 2016](#)).⁷ However, after the Fukushima incident, the US implemented numerous activities consistent with guidelines to mitigate negative nuclear events (Xu et al. [2021](#)). Additionally, advanced nuclear offers additional safety measures and sustainable features not present for legacy nuclear power plants ([Rehm 2023](#)), but technical obstacles and limited resources may limit the adoption of nuclear globally as a climate change mitigation measure ([Muellner et al. 2021](#)). Nuclear energy generation does dampen the effect of CO2 in the United States ([Hassan et al. 2024](#)).
 - The risks and potential negative health consequences of nuclear energy on humans and the environment are summarized in Alhathi et al. ([2025](#)).
 - Small Modular Nuclear Reactors
 - There is a lack of a performance/safety record on the passive safety design aspects of small modular nuclear reactors (SMRs) which is of concern ([NRDC 2023](#)).

⁷ Several important caveats to mention regarding Wheatley et al. 2016 - the study details the risks present from continuing to operate existing reactors, it does not assess the risks from not operating them (such as greater reliance on fossil fuels). As is well known, fossil fuel combustion presents significant health risks in addition to climate disruption. There are significant risks from hydropower and other power sources also, including those associated with the extraction of rare earth minerals. Another caveat is that the study is based on the existing fleet of Generation II plants and is therefore not relevant to the risks that may be presented by Gen III, Gen III+ and Gen IV plants, all of which have passive safety features unlike Gen II plants.

- There is significantly reduced control and security staffing at SMR plants which provides cost savings but could increase cyber and physical threats to a SMR, which could harm nearby communities and wildlife ([EPRI 2016](#))
 - Land Use
 - Nuclear reactors generally need more land than SMRs, which could reduce greenspace communities may utilize.
- **Recommendations to Mitigate Disbenefits**
 - Community Engagement
 - Engage communities to ensure proper siting of nuclear facilities.
 - Implement Protective Security and Cyber Security Measures
 - Digitization of nuclear facilities is important for ensuring proper plant performance and cost competitiveness. Implementing measures that protect nuclear facilities from the range of cyber threats and vulnerabilities is imperative (overview of specific risks and recommendations are provided at [Ayodeji et al. 2023](#); [Jayakumar 2023](#))
 - Implement physical security measures consistent with national recommendations (like those outlined here by the Department of Energy, [Vaibhav et al. 2019](#)) are necessary.

Measure 8: Generating additional clean energy through hydrogen utilization in fuel cells; hydrogen or renewable natural gas utilization in combustion-based resources (e.g. CTs or combined cycle gas turbine, CCGTs); and other technologies

- **Stakeholder Input**
 - Stakeholders have noted that, “Most people are paying more for delivery of electricity rather than electricity usage. People don’t understand 30-year leases on solar panels. More community solar is needed, versus company-driven solar.” There is an impression among stakeholders of 20 years or so of bad solar policies which the State hopes to correct through education and enhanced community partnerships in the coming years.
- **Qualitative Benefits**
 - Physical Health
 - **Improved Air Quality:** Hydrogen fuel cells generate electricity through an electrochemical reaction between hydrogen and oxygen, producing only water and heat as byproducts and therefore result in improved air quality compared to fossil fuel generated electricity ([Ahmed et al. 2023](#))
 - **Reduced Noise Pollution:** Hydrogen fuel cells produce very little noise compared to traditional combustion engines which makes them ideal in areas where noise pollution is a concern (e.g., urban areas) ([Shabani and Andrews 2015](#))
 - Solar Benefits to Physical Health
 - Solar power reduces energy costs for the owners of the solar panels or those participating in a community program.
 - Solar panels on agricultural land could provide financial support to NJ farmers ([Peretzman 2023](#)) as long as the solar panel locations do not block high quality farm land from being farmed ([Makhijani 2021](#)).
 - Workforce Development
 - The generation, transport, and installation of these technologies will provide jobs in New Jersey.
- **Qualitative Disbenefits**
 - Physical Health

- **Injuries Possible:** Hydrogen fuel cells can be potentially hazardous if not handled properly. Hydrogen gas is highly flammable and can ignite easily, and leaks can lead to explosions ([Ozbek et al. 2020](#)).
 - **Possible Counterproductive Solution:** Hydrogen fuel cells require hydrogen as a fuel source, which is typically produced through electrolysis of water or from natural gas through a process called steam methane reforming. Both of these processes require energy and can result in greenhouse gas emissions, which can offset some of the environmental benefits of using hydrogen fuel cells ([Khan et al. 2005](#)).
 - **Environmental Harm Can Cause Human Health Issues:** New Jersey does not produce natural gas and does not have any natural gas reserves ([EIA NJ Profile 2025](#)). If the state decided to store natural gas underground, this may require clearing and leveling of an area of land around the well access site which may disturb people, wildlife, and water resources ([EIAb 2024](#)).
- Roadblocks to Traditional Solar
 - Older homes may struggle to implement solar because the homes cannot support the weight of solar panels. A possible solution is community solar gardens (solar arrays are offsite but provide the same metering benefits as if panels were on homes). ([Fenton 2022](#))
- Economic Stress
 - **Expensive Infrastructure:** There are high upfront costs associated with building power plants or updating the grid to support natural gas (or other clean sources of energy like green hydrogen) as an energy source for generating electricity. While residential properties that use natural gas as gas for heating, cooking, and drying their clothes save households on average \$1,068 per year ([AGA 2023](#)), the infrastructure needed to support natural gas as an energy source for powerplants can be expensive ([EIA 2025](#)). Federal and private funding can mitigate the cost of such projects, but ultimately consumers will pay for the infrastructure long-term through their utility bills or taxes.
- **Recommendations to Mitigate Disbenefits**
 - **Follow Regulations:** Follow proper environmental and human health protections consistent with local, State, and Federal regulations to ensure any projects related to energy infrastructure have minimal negative impact on environmental and human health.
 - **Engage Community Members:** Engage with local communities to ensure they have a voice in the final location of any new energy infrastructure and are educated on the safety precautions in place to protect human health, the local community, and the local ecosystem.
 - **Utilize Principles of Distributive Fairness:** The State may consider a payment scheme that provides flexibility to ensure the financial burden of building and maintaining new energy infrastructure is equitable. This could include the Ability to Pay Principle (where the burden of paying for public activities generally should be borne in greater proportion by agents who are best able to contribute) ([Granqvist and Grover 2016](#)).

B. Transportation Sector

A summary of information regarding each measure under this sector is provided in the table below. Details regarding the Benefits, Disbenefits, and Recommendations to Mitigate Disbenefits can be found below the table.

CCAP Measure	Description	Direct Impacts/Changes	Summary of Impacts
1. Implement a GHG reduction planning standard for state and Metropolitan Planning Organization (MPO) transportation plans to reduce statewide light-duty vehicle miles travelled (VMT) 3% by 2050.	Model this standard after Colorado's SB 21-260 law which requires state and MPO transportation plans to assess and mitigate their GHG emissions impact to reach GHG reduction targets, including VMT , by a near-term target year. It advances public transit, telework, bike and pedestrian infrastructure; transit-oriented development; and more.	This measure would decrease the amount of time residents of New Jersey spend driving and increase the amount of time residents of New Jersey spend using public transit, biking, walking, and other modes of transportation.	+ Physical health/improved air quality + Mental Health + Workforce Development - Physical health/pedestrians near streets, poor air quality and accident risk - Inequity in eMobility access and resources
2. Implement large-scale public transit projects to reduce statewide light-duty VMT	Fund all levels of planning and implementation of large-scale transit projects to transfer the largest numbers of trips from driving to transit by connecting residential hubs with commercial and recreational hubs across the state. Include projects such as The Secaucus Meadowlands Transitway and South Jersey Bus Rapid Transit (BRT). Implement last-mile solutions to transit hubs.	This measure would decrease the amount of time residents of New Jersey spend driving and increase the amount of time residents of New Jersey spend using public transit, biking, walking, and other modes of transportation.	+ Physical health/improved air quality + Mental Health + Workforce Development - Physical health/pedestrians near streets, poor air quality and accident risk - Inequity in eMobility access and resources
3. Explore new pricing mechanisms and other transportation alternatives that reduce VMT and emissions	Develop and implement alternative for gas tax, such as distance-based user fees, VMT fees, etc. and other travel demand management which may include congestion pricing, parking cash-out (PCO) and car-free tax incentives.	Transportation pricing strategies were shown to have the largest potential impact on regional light-duty VMT in EPA case studies assessing the impacts of numerous travel efficiency strategies (EPA, 2020). They found a \$0.05-\$0.10/mi price resulted in 3.83%-9.56% decrease in VMT and emissions compared to BAU cases. In the first 4 months of NYC's Congestion Pricing, 8.1 million fewer vehicles drove into Manhattan's Central Business District (MTA) and \$215.7 million was generated for the transit system. A similar localized NJ pricing policy could (temporarily) exempt EVs.	+ Physical health/improved air quality + Mental Health + Workforce Development - Physical health/pedestrians near streets, poor air quality and accident risk - Inequity in eMobility access and resources
4. Implement current policies and expand current transportation electrification programs.	NJ must continue Advanced Clean Cars Program (ACC) implementation and incentivize rapid, widespread adoption of electric vehicles throughout the state. While the future of the Advanced Clean Cars 2 (ACCII) and Advanced Clean Trucks (ACT) programs are uncertain, New	New Jersey has developed a suite of policies and programs aimed at supporting the electrification of light-, medium-, and heavy-duty vehicles, as well as off-road vehicles and equipment. The State provides financial incentives for the purchase and lease of	+ Physical health/improved air quality + Mental Health + Public Safety + Workforce Development + Increased financial security + housing quality

	Jersey must maintain its commitments made under the EV Law and the Medium-and Heavy-Duty Memorandum of Understanding . These commitments work to support New Jersey's momentum towards the outcomes projected under ACCII and ACT.	electric vehicles, the development of community car-sharing programs, and expansion of the charging station network. These are paired with non-financial support including technical assistance, workforce development, and education/ outreach programs to increase awareness of electric vehicle benefits.	+ climate resilience + energy security + noise reduction - Physical health/pedestrian injury - Financial uncertainty
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Stakeholder Input Regarding Transportation GHG Reduction Measures:

- Efforts to support and expand micromobility and eMobility, while important, should not detract from the need to accelerate electrification – especially that of school and transit buses.
- There is a deficit of public transit options and quality of service to South Jersey communities
- There is a desire for expansion of public transit bus services to run later into the evening, add additional stops, and add real-time trip information technology to the app and at stops.
- Support for public transit expansion projects in South Jersey includes projects like the Glassboro-Camden light-rail, bus rapid transit (BRT), and electrified Jitney services that would connect between, and revive, existing and legacy rail lines for passenger rail service.
- Support exists for ‘complete streets’ funding and infrastructure projects that improve safety and accessibility for all transportation modes (pedestrians, bicyclists, and vehicles) with acknowledgments that bicycling may not be a feasible option for many South Jersey rural communities.

Measure 1-3: These measures all have a focus on reducing vehicle miles traveled by encouraging individuals to use public transit, bike, walk, telework.

- **Qualitative Benefits**
 - Physical Health
 - Improved air and water quality – motor vehicles emit pollutants into the atmosphere as a by-product of combustion and through other mechanisms like fuel evaporation, tire/break wear, and the creation of road dust from the wearing of pavement ([Fang and Volker 2017](#)). Reducing the number of vehicle miles traveled removes these pollutant sources as well as the pollutants associated with fuel refining, vehicle manufacturing, roadway construction, roadway maintenance that enter the air and local waterways (via runoff) ecosystems ([Fang and Volker 2017](#)).
 - Improved cardiorespiratory fitness for those using e-bikes ([Bourne et al. 2018](#)). This is a positive feedback loop as offering e-bikes as an alternate mode of transportation can decrease car use and increase intrinsic motivation to cycle ([Bjørnara et al. 2019](#)). Even if e-bikes on average take a longer time than cars or public transport to reach the same destination, they may still be preferred, as they allow flexibility in schedule, the opportunity to enjoy the outdoors, and encourage physical activity ([Plazier et al. 2017](#)).
 - Mental Health
 - Avoided Long Driving Commutes: Long driving commutes can contribute to poor mental health outcomes like stress, negative moods, poor concentration, driver error and traffic collisions ([Hennessy 2008](#)). Reducing the amount of vehicle miles traveled reduces congestion on regional and local road networks ([Fang and Volker 2017](#)) which can reduce stress for individuals who still need to drive to get to work.

- Reduced Cost: For long trips, using public transit (e.g., buses, commuter rail) can be cheaper than driving. For short trips, forms of active transport (e.g., biking, walking) can be cheaper than driving because of lower capital and operating costs ([Fang and Volker 2017](#)). Financial stress can contribute to poor mental health ([Kiely et al. 2015](#))
 - Workforce Development
 - New jobs for individuals managing and monitoring e-bike and e-scooter locations in both dockless and docked systems.
- **Qualitative Disbenefits**
 - Physical Health
 - Biking or walking in areas with inadequate infrastructure can be hazardous as people need to travel in unprotected roadways which may lead to increased risk of collisions ([Zhu et al. 2022](#)). Walking and biking near major roadways can also have health impacts from breathing in vehicle exhaust ([Frank and Engelke 2005](#)).
 - Inequity in eMobility Access
 - Carpooling/ridesharing as part of a e-mobile initiative are most effective for commute trips; individuals that are single or married without children are more likely to participate; and most carpools are among family members ([Shaheen and Cohen 2019](#))
 - High expense – potential VMT fees and other travel demand management programs which might include congestion pricing, parking cash-out (PCO) could provide a barrier to low-income families ([Rahman et al. 2024](#)).
 - A study of bike theft in London, UK showed that proximity of bikes to public amenities (e.g., bicycle stands, railway stations, universities, vacant buildings, and pawnshops) is a good predictor of bike theft ([Mburu and Helbich 2016](#)). Care should be taken to build the proper storage infrastructure for e-bikes and e-scooters and to educate the public on smart storage and locking strategies.
- **Recommendations to Mitigate Disbenefits**
 - Create Standards for Equitable Transportation Infrastructure
 - Conduct a pilot program and related survey to measure the equitable availability and utilization of e-mobility options similar to the study conducted by Populus in Washington, DC ([Populus 2018](#))
 - Refer to existing guidance on NJ Complete Streets created by the NJ Bicycle and Pedestrian Resource Center which provides recommendations on how to enable safe access for streets by pedestrians, bicyclists, motorists and transit riders of all ages and abilities ([NJBPRC 2025](#)).
 - Create Incentive or Financial Support Programs
 - Use existing research ([Siddiq et al. 2021](#), [Dixon 2025](#), [RPA 2025](#)) to generate financial support or incentive programs.
 - Create car-free tax incentive programs like those proposed in other states (e.g., California – The Washington Post [2022](#))

Measure 4: Reduces the number of fossil fuel vehicles on the road.

- **Qualitative Benefits**
 - Physical Health
 - Exposure to traffic related particles can result in various poor health outcomes which can disproportionately impact the elderly, the young, and those with preexisting health conditions ([Ghosh et al. 2016](#)). Of note, in addition to the negative health outcomes below from air pollution, is that New Jersey is entirely in the high and highest impact zone for deaths by diesel pollution ([CARF 2025](#))

- Poor Birth Outcomes: decreased birth weight ([Basu et al. 2014](#))
- Increased Asthma: It is estimated that there are approximately 4155 cases of childhood asthma per year in New Jersey that can be attributed to traffic related air pollution ([Thurston et al. 2019](#)) and that traffic pollution can exacerbate asthma symptoms in asthmatic children ([Pollitt et al. 2016](#))
- Cardiac Issues: This includes cardiorespiratory disease ([Requia et al. 2018](#))
- Cancers: Poor air quality is linked with lung cancer ([Hamra et al. 2014](#)) and non-lung cancers ([Kim et al. 2019](#))
- Poor Cognitive Development and Neurological Disorders: PM_{2.5} exposure increases the risk of stroke, autism spectrum disorder, Alzheimer's disease, and Parkinson's disease ([Fu et al. 2019](#)) as well as prevalence of autism in children when mothers were exposed to the pollutant in their third trimester ([Raz et al. 2014](#)); and brain aging and acceleration of Alzheimer's in older women ([Cacciottolo et al. 2017](#)). Though one article clarifies that residential proximity to major roadways during gestation and early life may affect cognitive development in children, the influences of pollutants and socioeconomic conditions on cognition may be difficult to disentangle ([Harris et al. 2015](#))
- MHDV
 - Reduced air pollution from diesel exhaust ([Mac Kinnon et al. 2021](#)) can be experienced locally as well as in surrounding counties ([Olawepo and Chen 2019](#)).
 - Transitioning from diesel school buses to electric can have meaningful and cost-effective impacts on student health and cognitive function ([Austin et al. 2019](#))
 - NJ is in the top 5 states that will experience the greatest health benefits from electric HDV adoption ([Turk 2020](#)). The long-term health benefits of switching to EVs outweighs the cost of EV infrastructure ([House and Wright 2019](#))
 - Lithium batteries and hydrogen fuel are largely considered safe given proper transport and handling ([Singla et al. 2021](#), [Tae 2021](#))
- Mental Health
 - Exposure to air pollution has a negative impact on mental health and anxiety levels.
 - Poor Mental Health: Exposure to elevated levels of PM_{2.5} is associated with increased levels of anxiety ([Power et al. 2015](#)) and increased psychological distress (e.g., depression and other mood disorders which interfere with social functioning and have been associated with increased risk of chronic disease and mortality) ([Mehta et al. 2015](#), [Sass et al. 2017](#)).
 - Decreased Life Satisfaction: Higher income people who were interviewed reported higher levels of happiness, and people interviewed on days with poor local air pollution report lower levels of happiness ([Levinson 2012](#)). Another study conducted in Salt Lake County, Utah found an unsettling correlation: an increased risk of suicide was associated with acute exposure (i.e., several days of exposure) to elevated nitrogen dioxide and PM_{2.5} levels during the days immediately preceding suicide attempts ([Bakian et al. 2015](#)). Another study found higher air pollution reduces life satisfaction particularly for individuals with poor health status, but this relationship was true for SO₂ concentrations, not for carbon monoxide, nitrogen dioxide, or PM_{2.5} ([Barrington-Leigh and Behzadnejad 2017](#)).
 - Electric buses make less noise and produce fewer vibrations than diesel buses, making for a more comfortable riding experience ([Adheesh et al. 2016](#)). Electric MHDV are less noisy than traditional models which can reduce stress and improve mental health.
 - EVs, particularly Teslas, are less likely to be stolen than traditional internal combustion cars, in part due to enhanced security features ([Edelstein 2023](#))
- Public Safety - Studies suggest increased anxiety and diminished mental health driven by air pollution can foster an environment with more crime ([Lu et al. 2018](#)).

- A study of all counties in Ohio, USA found exposure to traffic related pollutants is associated with an increased risk of going to court, but the study cautions that correlation does not mean causation and emphasizes that this relationship warrants further examination ([Haynes et al. 2011](#)).
 - Long term exposure to PM_{2.5} (over a period of years) may increase delinquent behavior of urban adolescents ([Younan et al. 2018](#)).
 - A study estimates the effect of short term PM_{2.5} exposure on crime across 99% of counties in the contiguous US and found increases in PM_{2.5} raise assaults ([Burkhardt et al. 2019](#)). The biological pathway for this reaction requires more research, but these authors hypothesize the relationship between pollution and aggression is driven by physiological processes and is thus uniform across the US and does not depend on observable sociodemographic characteristics such as income or race, but the relationship may be influenced by age such that older populations may be more susceptible to changes in air pollution ([Burkhardt et al. 2019](#)).
- Workforce Development
 - Being employed in a field related to community health and environmental protection (like a job installing EV stations) can improve health and the economics of disadvantaged individuals and communities, thus improving social well-being and mental health ([Freudenberg and Tsui 2011](#))
 - Employment positively impacts health ([Ross and Mirowsky 1995](#))
 - When the state transitions to 100% renewable energy, the 20,000 NJ residents employed in fossil fuel industries will need to find new work ([Vachon 2019](#)), and decarbonization is one industry those workers could transition to.
- Increased Financial Security
 - When considering automated diesel heavy-duty trucks and automated electric heavy-duty trucks, the health impact costs resulting from the diesel are two times higher than electric ([Sen et al. 2020](#)). Less illness means fewer doctor visits for individuals which, in turn, saves money.
- Improved Housing Quality
 - An EV charging port is a high-end amenity that increases property values for properties that are suburban, medium-sized, or offices ([Freybote 2021](#))
- Workforce Development
 - With enhanced eMobility services, new jobs would be created to staff those services. For example, jobs could include transporting people who are elderly or disabled to their destination (e.g., grocery store, hospital) ([Orona-Hinojos et al. 2025](#)).
- Increased Climate Resilience
 - Increased ability to evacuate during and in the aftermath of extreme climatic events creates adaptive capacity enhancement. ([Dulal 2016](#))
 - Improved accessibility also yields increased savings and capital assets accumulation resulting from improved productivity ([Dulal 2016](#))
- Increased Energy Security
 - After initial investment, the cost of owning ([Liu et al. 2021](#)) and traveling ([Coren 2023](#)) is generally lower for electric vehicles than internal combustion engine vehicles.
 - EVs can provide lower cost and more reliable transportation for residents of low-income and minority communities when compared with fossil fuel vehicles ([Canepa et al. 2019](#)).
- Reduced noise
 - EVs reduce urban car noise pollution ([Pardo-Ferreira et al. 2020](#)).
- **Qualitative Disbenefits**
 - Physical Health

- Electric trucks are notably quieter than diesel engine trucks at lower speeds ([Pallas et al. 2014](#)). Electric vehicles have a 30% higher pedestrian traffic safety risk, under high ambient sound environments, than traditional combustion engines ([Karaaslan et al. 2018](#)).
 - Because electric vehicles are relatively quiet at a slow speed these cars can be a threat to pedestrians. A study conducted by the US Department of Transportation in 2017 found hybrid and electric vehicles are 50% more likely to have a pedestrian crash at low speeds than traditional internal combustion cars ([DOT 2017](#))
- Financial Uncertainty
 - Studies show conflicting evidence regarding whether electric MHDVs have lower operation and maintenance costs than traditional diesel trucks. [Cunanan et al. 2021 indicates](#) EV maintenance costs are an estimated 20-30% lower than diesel-powered vehicles. However, Teoh ([2022](#)) suggests that if the charging infrastructure for electric MHDVs is not planned properly (*e.g.*, locations in strategic/convenient locations for drivers) operation and maintenance may be more costly than for diesel trucks due to wear on batteries. Additional costs in the supply chain may lead to increased costs for consumers.
- **Recommendations to Mitigate Disbenefits**
 - Stakeholder Input - Stakeholders had many ideas regarding how to improve workforce development opportunities in the renewable energy field, including the following:
 - Soft skills and math training to accompany these apprenticeship programs can have an impact, along with developing infrastructure to sustain these jobs.
 - Trainings and jobs should be union-eligible, so the hours spent in the training program could count as union-service.
 - Even school-aged children (including middle-schoolers) can be introduced to these careers- through involving teachers and educators- and existing programs such as debate.
 - Stakeholders also recommended there be better incentives for truck drivers to make the transition, as electric trucks can be more expensive than their diesel counterparts. They commented that the burden on electrifying shouldn't be on individuals.
 - Stakeholder Input – Prioritize EV charging stations near non-profit organizations, shopping centers, bookstores, cafes, public buildings, public housing, and local businesses to prioritize charging that meets the needs of residents who live in cities, rather than visitors.
 - Engage Local Communities in Charging Infrastructure Planning
 - Stakeholders identified the need to change “truck routes to direct them away from neighborhoods, and to ensure charging stations for trucks do not burden residential areas.”
 - Training Programs Should not be limited to Electric Vehicle Charging
 - Training programs at the community college, technical college, and university level are currently lacking. These programs are important for ensuring electric vehicles are integrated quickly and efficiently with the grid ([Freeman et al. 2018](#)). Training programs for EV stations are welcomed but should not detract from the larger need to have wide-reaching training programs for an entirely green energy grid, consistent with the other Sectors in this community benefits analysis.
 - Consider establishing a workforce training program to create a pathway for people to become electricians for installing EVs charging stations, and similar pathways for good paying jobs.
 - Consider Expanding Charging Stations for MHDV Beyond Ports

- Existing literature shows that depots, warehouses, and vehicle yards are the most likely location for MHDV charging ports as they are convenient for trucks to recharge for short haul operations ([Borlaug et al. 2021](#)). Identifying locations for MHDV charging stations should be a regional conversation involving local communities and fleets operating MHDVs to ensure the state's charging infrastructure has the best coverage ([Teoh 2022](#)).
- The literature suggests the following opportunities for truck charging: downtime charging (e.g., charging at home or at a truck depot) and opportunity charging (e.g., charging during a scheduled stop in-route, at a destination, public fast charging, or battery swapping) ([Teoh 2022](#)).
- Create Policies for Eco-Labeling Products
 - Eco-labeling products and services based on their method of freight transportation could help consumers choose products that have been shipped more sustainably than others ([Kirschstein et al. 2022](#)) and bolster support for reducing emissions from ports.

C. Residential and Commercial Buildings Sector

A summary of information regarding each measure under this sector is provided in the table below. Details regarding the Benefits, Disbenefits, and Recommendations to Mitigate Disbenefits can be found below the table.

CCAP Measure	Description	Direct Impacts/Changes	Summary of Impacts
1. Accelerate heat pump installations	Expand and modify NJ incentive structure to prioritize adoption of heat pumps in residential and commercial buildings . Revise rate structures to align with increased electrification from heat pump adoptions.	This measure would result in, possibly, invasive construction activity inside existing homes, properties, and commercial buildings as well as in exterior spaces. Meaning, construction could cause disruption to the day-to-day activities of residents and businesses alike. Note: There are many kinds of heat pumps (explored in Wang et al. 2021)	+ Physical health/improved air quality + Financial Security + Workforce Development - Physical health/air pollution - Quality of life (noise pollution, expense)
2. Adopt a Clean Heat Standard	Require gas and delivered fuel utilities to reduce the emissions associated with the heating fuel they supply.	Typically, this involves building owners adopting “clean heat measures” such as installing a heat pump, improving the thermal efficiency of a building, or switching to biofuel/hydrogen rather than fossil fuels to heat their home, solar hot water systems, electric appliances, replacement of a manufactured home with a high efficiency manufactured home, and others. Another common eligible measure includes the development of the thermal networks by utilities. (NJ Proposed Bill 3374 2024)	+ Physical health/improved air quality + Mental Health + Improved Energy Security - Physical health/air pollution - Quality of life (noise pollution, expense, overpromised benefits)
3. Upgrade building envelopes	Implement various policies to retrofit 59% of existing residential and 72% of commercial buildings by 2050 and make 10% of low-to-	This measure would result in, possibly, invasive construction activity inside existing homes, properties, and commercial buildings as well as in exterior spaces.	+ Physical health/improved air quality + Mental Health + Improved Energy Security - Physical health/air pollution

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	moderate income properties electrification-ready. \ Typically, these upgrades can include adding insulation to walls and roof, air sealing, replacing windows, adding weather resistant barriers to homes that are being resided (Grable 2024). Electrification ready is just another way of saying weatherization (NYSERDA 2023).		- Quality of life (noise pollution, expense, overpromised benefits)
4. Establish all-electric building codes	Enact an all-electric building code that requires newly constructed buildings to have all-electric and energy efficient appliances and equipment that utilize either on-site or off-site renewable energy as its leading electricity source	This measure would impact new buildings being built for residential or commercial purposes.	+ Physical health/improved air quality + Mental Health + Improved Energy Security - Physical health/air pollution - Quality of life (noise pollution, expense, overpromised benefits)
5. Adopt statewide Building Performance Standards	As an extension to the State's existing benchmarking program, building performance standards would set energy efficiency standards for large commercial buildings greater than 25,000 square feet.	This measure would result in, possibly, invasive construction activity inside existing properties and commercial buildings as well as in exterior spaces.	+ Physical health/improved air quality + Mental Health + Improved Energy Security - Physical health/air pollution - Quality of life (noise pollution, expense, overpromised benefits)
6. Adopt Zero Emissions Standards for space and water heating	Require manufacturers and contractors for residential and commercial buildings to meet emission standards for newly installed furnaces, boilers, and water heaters	This measure would result in changes to manufacturing processes (and possibly transport) of furnaces, boilers, and water heaters to commercial and residential spaces.	+ Physical health/improved air quality + Mental Health + Financial Security + Increased safety - Human Health - Increased Costs
7. Lead by example by decarbonizing State, county and municipal resources	Require all State government buildings to perform energy audits and implement energy efficiency and electrification measures to reduce their building's emissions	This measure would result in, possibly, invasive construction activity inside existing properties and commercial buildings as well as in exterior spaces.	+ Physical health/improved air quality + Mental health + Financial Security + Improved Energy Security + Workforce Development - Physical health/air pollution - Quality of life (noise pollution, expense)

Measure 1: More heat pumps in residential and commercial buildings**- Qualitative Benefits**

- Physical Health
 - 70% of US houses could reduce GHG and co-pollutant emissions by installing a heat pump, but this depends on the electric grid, climate, baseline heating fuel, and housing characteristics ([Deetjen et al. 2021](#); [Kavanaugh 2025](#))
 - Health benefits may be greater in rural areas where residential and commercial buildings may not be able to connect to a municipally owned district heating system or piped gas ([Gradziuk et al. 2022](#)).
- Financial Security

- 32% of US houses would benefit economically from installing a heat pump, but this depends on the electric grid, climate, baseline heating fuel, and housing characteristics ([Deetjen et al. 2021](#); [Kavanaugh 2025](#))
 - Workforce Development
 - Heat pumps will require new jobs for installation and maintenance of systems ([Johnson 2024](#))
- **Qualitative Disbenefits**
 - Physical Health
 - Although residential furnaces and boilers often produce greater net greenhouse gas emissions than heat pumps do, they often produce fewer health-damaging pollutants like SO₂, NO_x, and PM_{2.5} than are produced when the same amount of heat is delivered by generating electricity and using it to energize a heat pump ([Vaishnav and Fatimah 2020](#))
 - If all single-family homes in the US adopted heat pumps it would reduce residential CO₂ emissions but may create \$4.9 billion in health damages from criteria air pollutants ([Deetjen et al. 2021](#))
 - Quality of Life
 - Heat pumps can be exceptionally loud indoors – homeowners/renters should be notified of the pros/cons of installing green heating/cooling systems ([Strunburg et al. 2024](#))
 - Heat pumps are expensive
 - Heat pumps are more expensive to install than furnaces or boilers and electricity is often more expensive than fuels like natural gas ([Billimoria et al. 2018](#))
 - If all single-family homes in the US adopted heat pumps it would reduce residential CO₂ emissions but may create \$25.2 billion in private economic costs (initial installation, maintenance, etc.). ([Deetjen et al. 2021](#))
 - Heat pumps may contribute to peak electricity demand which may stress the electric grid and contribute to high energy prices ([Deetjen et al. 2021](#); [Edwards et al. 2024](#))
 - Benefits not realized by economically vulnerable communities
 - Within states, minority communities are disproportionately less likely to reap the benefits of using a heat pump ([Edwards et al. 2024](#)).
 - Higher incomes among households in Black-majority census tracts are associated with a higher likelihood of heat pump use relative to other groups, suggesting distinct relationships between heat pump use, race/ethnicity, and income ([Edwards et al. 2024](#)).
- **Recommendations to Mitigate Disbenefits**
 - Ensure building electrification policies are location and context specific to ensure heat pumps are implemented where energy bills will be reduced, low-cost installation programs are targeted toward vulnerable communities, and are implemented with the engagement of communities and experts ([Edwards et al. 2024](#)).

Measures 2-5: Reduce energy usage and related emissions from residential and commercial buildings (via weatherization and implementing more energy efficient heating systems)

- **Qualitative Benefits**
 - Physical Health
 - Improve indoor air quality by using less harmful building materials (people spend 90% of their time indoors) ([Hu 2019](#))

- Electric and fully sufficient homes have been found to increase thermal comfort, reduce heat related illnesses and death, and reduce healthcare costs ([Dulal 2016](#))
- Carbon neutral buildings (e.g., roof and façade materials, orientation, shading, and landscaping) can reduce urban heat islands ([Newton and Rogers 2020](#))
- Mental Health
 - Net-zero buildings can improve social-well-being and improve quality of life, depending on the use of the building being decarbonized ([Rau 2017](#)).
 - Net-zero buildings (residential and commercial) often require new construction which makes the building more aesthetically pleasing, comfortable, and easier to use ([Metzger et al. 2023](#))
 - Reduced smell from on-site wastewater reuse for building electrification at WWTP may reduce undesirable smells down-wind of the WWTP (if integrated properly).
- Improved Energy Security
 - Going electric has been found to increase productivity at home (e.g., accomplishing day-to-day tasks) ([Dulal 2016](#)).
 - Weatherizing commercial buildings enhances the resilience of buildings to extreme weather conditions which can be associated with insurance premium discounts and grid services (e.g., load shifting capabilities that enable utilities to make better use of renewable energy resources) ([Metzger et al. 2023](#))
- **Qualitative Disbenefits**
 - Physical Health
 - If homes are sealed for efficiency during the “electrification process,” it could exacerbate indoor pollutants if not ventilated properly ([Pigg et al. 2018](#))
 - Quality of Life
 - Heat pumps can be exceptionally loud indoors – homeowners/renters should be notified of the pros/cons of installing green heating/cooling systems ([Strunburg et al. 2024](#))
 - Overpromised Benefits
 - Net positive windows (NPW, a window system that enables sufficient solar heat gains during winter to reduce heating demands, while minimizing heat gains during summer to lower cooling loads) is challenging for offices with large windows located in hot climates. An analysis found NPW for static windows is only feasible when there is integrated design and operation strategies used such as optimized thermal and optical properties for the glazing of windows coupled with right air leakage and enhanced daylighting controls (exterior and interior shades) ([Ohene et al 2025](#)).
 - Additionally, it is important to note, reporting mechanisms on the benefits of zero emissions buildings and complexes are not unified or consistent such that the benefits of net-zero buildings are often inflated. One study found it is crucial to report on the impacts on a “per complex” and “per person” unit because the use of the “per square meter” metric is misleading ([Lausset et al. 2019](#)). The authors caution those considering zero-emissions complexes to also report on the entire life cycle of green buildings (i.e., construction including

materials and travel, the functional years of the building, and end of life) as the true impact of the action may not be net positive from a reduction of GHG or pollutants ([Lausselet et al. 2019](#)) such that the benefits are not fully realized by impacted communities.

- **Recommendations to Mitigate Disbenefits**

- Stakeholder Input
 - Stakeholders have requested “energy-efficient homes and heat pumps that keep them warm in the winter.” It should be noted that this comment was received in December 2023, during the winter.
- Duplicate Holistic Approach of Existing State Programs: The Whole House program coordinates energy efficiency improvements while remediating health and safety hazards that pose a threat to human health (mold, asthma triggers, slip and fall risks, lead-bant, pests, other toxins). If the enabling actions continued this type of holistic approach to energy efficiency updates, that would help to avoid some disbenefits.
- Consider Lessons Learned from Past “Smart City” Development
 - Lessons learned from “smart city” development may be helpful in targeting the right individuals and skillsets necessary to build green programs that last ([van Winden and van den Buuse 2017](#))

Measures 6: furnaces, boilers, and water heaters in residential and commercial properties must meet emissions standards

- **Qualitative Benefits**

- Physical Health
 - Improved Air Quality: Burning gas in household appliances like furnaces and water heaters generates a range of pollutants that harm health, including nitrogen oxides (NO_x) and fine particle (PM_{2.5}) pollution. Additionally, NO_x emissions from gas-burning equipment are also a precursor to ozone pollution – a major component of smog – and “secondary” PM_{2.5} ([ALA 2025](#), [CARB 2025](#)) Exposure to NO_x from household gas appliances can exacerbate asthmatic symptoms: a study found children experienced increased chest tightness as well as asthma attacks on the same day as their nitrogen dioxide exposure, and adults experienced increased coughing the day after their nitrogen dioxide exposure ([Smith et al. 2000](#)). Replacing improperly functioning household appliances would ameliorate these health issues.
- Mental Health
 - High-efficiency boilers provide more reliable heat than other boilers ([RB Heating 2025](#)) which reduces homeowner anxiety regarding heating their homes in cooler weather. The inability to heat your home can result in severe mental distress for homeowners including: increased risk of cardiovascular events, stroke and myocardial infarction, increased negative effects from chronic and acute respiratory disease, increased colds and influenza, exacerbation of chronic conditions (arthritis, rheumatism, Parkinson’s, diabetes), increased risk of poor nutrition, and increased risk of injury from domestic accidents ([WHO 2018](#); [O’Sullivan 2022](#)).
- Decreased Energy Costs and Greater Energy Security
 - New high efficiency furnaces, boilers, and water heaters are more energy efficient (*i.e.*, use more of the heat produced during the combustion process to heat a residential/commercial building and it’s water) which will lower energy bills ([Peavey 2023](#)).
- Increased Safety

- Standard furnaces (*i.e.*, non-energy efficient) that use open combustion to generate heat can produce carbon monoxide which can be trapped in a well-insulated home. This is a health hazard that is ameliorated by high-efficiency furnaces that do not use open combustion ([Peavey 2023](#)).
- **Qualitative Disbenefits**
 - Increased Costs
 - Installation costs for high-efficiency furnaces may be high because installation requires new piping to allow for air combustion and piping for drainage for the condensate ([Peavey 2023](#)), but it is a one-time expense.
 - Not all high-efficiency furnaces are made equal. For example, there are single stage, two stage, and modulating furnaces all of which use different intensities and durations of heat to maintain warm temperatures. Two-stage furnaces generally provide greater efficiency in heating than single stage ([Peavey 2023](#)).
 - Human Health
 - This installation of any new household appliance comes with an inherent risk of improper installation. When furnaces, boilers, and hot water heaters are installed incorrectly, this can result in water damage from leaks, fire or explosions from improper connections, gas leaks, carbon monoxide poisoning, electric shock from poor wiring, or decreased efficiency and higher utility bills due to poor installation ([Paschal 2023](#)).
- **Recommendations to Mitigate Disbenefits**
 - Education
 - Educate homeowners on furnace basics to ensure they are installing the type of furnace that is best for their needs and the environment.
 - To promote safety, encourage homeowners and building managers to use trained professionals to install energy-efficient furnaces, boilers, and water heaters to mitigate the risk of harm to person or property during/after the installation process.
 - Educate homeowners and building managers on furnaces, boilers, and hot-water heaters, and their maintenance and repair needs.
 - Insure financial programs exist to encourage the installation of heat pumps and to implement weatherization work, particularly for economically vulnerable households.
 - Refer to existing resources to accomplish these education goals, such as the New Jersey WAP Weatherization Field Guide, SWS-Aligned Edition ([Kriger et al. 2021](#)).

Measure 7 – Lead by example, with state buildings implementing Measures 1-6.

- See benefits, disbenefits, and recommendations to mitigate disbenefits of Measures 1-6 above.

D. Industrial Sector

A summary of information regarding each measure under this sector is provided in the table below. Details regarding the Benefits, Disbenefits, and Recommendations to Mitigate Disbenefits can be found below the table.

CCAP Measure	Description	Direct Impacts/Changes	Summary of Impacts
1. Adopt manufacturing equipment efficiency standards and incentives for energy efficient technologies in manufacturing.	Require manufacturers of new industrial furnaces and water heaters used in manufacturing to meet energy efficiency standards. Incentives would support installation of industrial heat pumps, thermal batteries, and other energy efficient technologies.	This measure would impact workers building, installing, and managing heat pumps, thermal batteries, and other energy efficient technologies. This could also include incentivizing such things as: smart-monitoring controls (software + sensors); cog-belts; properly-sized and variable speed motors; high efficiency compresses air systems and alternatives; installing process control technologies, reducing leaks, adding insulation and using boilers in a series to improve efficiency of boilers as well as installing properly sized condensing boilers. This could also include installing waste heat recovery systems (CHP, preheat loads etc.); adhering to an energy management system like ISO 50001 (i.e., enrollment in USDOE's 50001 Ready Program) or building upgrades to envelope, HVAC systems and lighting, as well as implementing temperature setbacks in non-working hours.	+ Physical health/improved air quality + Reduced Energy Costs + Improved Housing Quality + Financial Security + Workforce Development - Environmental Health - Physical Health (exposure to improperly handled materials) - Reliability of Industrial Heat Pumps - Quality of Life (noise pollution, expense)
2. Implement a mandatory emissions reduction program for high-emitting sources in the industrial sector.	Reduce and invest program would set a declining cap on emissions from sources that emit 24,000 MT/year or more, to reduce emissions a specific percentage (25%) below baseline levels by 2050		+ Physical health/improved air quality - Decreased services - Increased noise pollution

Measure 1: Hold manufacturers to standards that would allow other measures to be implemented (installation of industrial heat pumps, thermal batteries, and other energy efficient technologies)

See “[Residential and Commercial Buildings](#)” [Measure 1](#) for the qualitative benefits, qualitative disbenefits, and recommendations to mitigate disbenefits specific to heat pumps. Below is additional information regarding thermal batteries and industrial heat pumps which can provide heat at higher temperature ranges than residential heat pumps.

- Qualitative Benefits

- Physical Health
 - A comparative analysis of ground source heat pump systems to other methods of residential space heating and cooling showed that GSHP systems are an ideal use of energy efficiency technology, having a significantly [lower environmental impact](#) than a household reliant of electricity alone ([Smith et al. 2021](#)).
 - Industrial heat pumps use electricity instead of coal or gas as their fuel source, so industrial heat pumps (such as those used for food and beverage, glass, pulp and paper, and chemical production) have the ability to be powered by renewable energy. This can lead to air quality improvements (e.g., sulfur dioxide and nitrogen dioxide avoided emissions, as well as PM_{2.5}) ([I3 2024](#); [McKinsey & Company 2024](#)).
- Reduced Energy Costs
 - Ground source heat pump systems implemented in residential areas had a significantly lower economic impact than all other space heating and cooling methods in New Jersey, making it more affordable than the other methods ([Smith et al. 2021](#)).
 - Industrial heat pumps can deliver heat at a lower cost than an externally supplied heat source like natural gas – this can result in reduced operation costs which can be used to fund even greater efficiency of electrified equipment and can help offset the price advantage of natural gas relative to electricity in many parts of the country ([I3 2024](#)).
- Improved Housing Quality
 - Thermal batteries, unlike lithium-ion batteries, can use materials to store heat that are abundant and relatively inexpensive including: salt, graphite, and clay bricks ([Rana and Pearce 2025](#); [Quinn et al. 2025](#)).
- **Qualitative Disbenefits**
 - Environmental Health
 - The installation of new sustainable refrigerators is a net benefit for the environment, however, the extraction and production of raw materials (e.g., steel, copper), can contribute to terrestrial ecotoxicity and human carcinogenic toxicity. For example, electric arc furnaces require steel and steel production generates toxic slag which can pose a significant human health risk. ([Temporim et al. 2024](#))
 - Physical Health
 - The disposal and recycling of furnaces can also have negative environmental and human health impacts. Chronic exposure to steel slag, for example, can result in terrestrial ecotoxicity rather than acute exposure ([Hu et al. 2020](#)). Moreover, steel slag is almost completely reused as low value-added aggregate in various construction applications and is considered a nonhazardous material unless it is slag dust (but it is being considered for reclassification by the EPA) ([Kurecki et al. 2024](#)).
 - Reliability of Industrial Heat Pumps – Industrial heat pumps can fail, largely due to fouling of heat exchangers and refrigerant leakage which can result in system shutdown, performance reduction, or release of refrigerant ([Aguilera et al. 2022](#)).
- **Recommendations to Mitigate Disbenefits**
 - Practice responsible recycling strategies of refrigerants.
 - Promote repair instead of disposal/recycling of furnaces, refrigerators, and other appliances and HVAC-R systems and components.

- Implementing specific fault detection and diagnosis methods for large-scale heat pump applications can mitigate the chances of system failure and subsequent negative consequences ([Aguilera et al. 2022](#))

Measure 2: Reduced emissions from large polluters, including manufacturing facilities and oil refineries.

- Qualitative Benefits

○ Physical Health

- Acute exposure to CO₂ can result in the following negative health impacts: inflammation, headaches (e.g., Sick Building Syndrome in office buildings), decreased cognitive function, poor decision-making and problem resolution, skills, decreased proofreading abilities, elevated heart rate, depression, and others ([Jacobson et al. 2019](#)).
- Chronic exposure to CO₂ can result in the following negative health impacts: inflammation, changes to the composition of bones (demineralization) and kidney (calcification), respiratory acidosis, behavioral and physiological changes, oxidative stress, as well as obesity. ([Jacobson et al. 2019](#)).
- The acute and chronic exposures to CO₂ and resulting negative health impacts are expected to be more pronounced for infants and children, who in general, breathe more air relative to their body weights than adults and are exposed during their critical periods of growth and development. Other vulnerable populations include individuals with pulmonary or neuromuscular diseases that cause the body to retain CO₂ due to impaired ventilation, elderly individuals who have less inherent ability to buffer against environmental stressors, hypertensive individuals, as well as those residing in urban areas that naturally have higher CO₂ concentrations in the atmosphere. ([Jacobson et al. 2019](#)).
- Outdoor air pollution has negative impacts to human health ([Curtis et al. 2006](#)). Air pollutants like nitrogen dioxide, sulfur dioxide, and carbon monoxide can cause harm and mortality to humans. Ambient NO₂ exposure may increase the risk of respiratory tract infections through the pollutant's interaction with the immune system. Sulfur dioxide (SO₂) contributes to respiratory symptoms in both healthy patients and those with underlying pulmonary disease. Both acute and chronic exposures to carbon monoxide are associated with increased risk for adverse cardiopulmonary events, including death. However, studies have not demonstrated a clear dose-dependent health risk response to increasing amounts of these pollutants except at high concentrations. In addition, a number of studies examining the effects of ambient level exposure to NO₂, SO₂, and CO have failed to find associations with adverse health outcomes ([Chen et al. 2007](#)).
- Hot weather can exacerbate the impact of outdoor air pollutants on human health. Increased levels of PM₁₀ and O₃ result in significantly higher rates of respiratory and cardiopulmonary mortality. Increments in PM_{2.5} and PM₁₀, O₃, CO, and NO₂ concentrations during high temperature episodes are dramatically associated with higher admissions to hospital in patients with chronic obstructive pulmonary disease, daily hospital emergency transports for asthma, acute and chronic bronchitis, and premature mortality caused by respiratory disease. Excessive respiratory health risk is more pronounced in elderly cohorts and small children. ([Grigorieva and Lukyanets 2021](#))

- Qualitative Disbenefits

○ Decreased Services

- Services provided by manufacturing facilities and oil refineries may be disrupted because of modifications that need to be made to reduce pollutant emissions. This may cause buildings to go offline for a period of time for upgrades to be made.

- Increased Noise Pollution
 - Industrial scale modifications may cause increased traffic and noise in an area surrounding the facility that is being upgraded.
- ***Recommendations to Mitigate Disbenefits***
 - Conduct meaningful community engagement to ensure impacted communities are aware of service disruptions and can adequately plan for those disruptions.
 - Worker Safety – Manufacturing facilities and oil refineries can take steps to protect workers’ health by reducing exposure to pollutants and noise. These protocols include: enhanced oversight and coordination among agencies regulating these facilities; emergency response and preparedness plans created, implemented, and practiced; filling in gaps in regulations to protect worker safety including training inspectors, providing a mechanism for employees and companies to share information and coordinate efforts; increased penalties to increase deterrence of worker safety violations ([Brown et al. 2013](#)). This includes following basic safety procedures to protect workers from co-pollutant exposure like PM_{2.5} (guidance available at [AirNow 2025](#)). The state may consider implementing these types of protocols and regulations to ensure worker health is protected.

E. Waste and Agriculture Sector

A summary of information regarding each measure under this sector is provided in the table below. Details regarding the Benefits, Disbenefits, and Recommendations to Mitigate Disbenefits can be found below the table.

CCAP Measure	Description	Direct Impacts/Changes	Summary of Impacts
1. Adopt stricter rules for landfill caps and lower threshold for emission reporting and controls at landfills and wastewater treatment facilities (WWTFs).	Modify GHG Monitoring and Reporting (GHGMR) rule to expand controls on methane emissions from landfills and wastewater and explore using remote sensing technology to detect leaks and enforce compliance	Wastewater treatment plants can generate methane from leaks in the piping, and even anaerobic digesters that harness methane as an energy source (Poore 2023). Landfills produce harmful emissions as well. Specifically, methane and other gases originating in landfills and WWTFs contribute to global climate change and can pose health risks. Mitigating these emissions would lower contributions to climate change and decrease associated health risks. This measure would impact owners of wastewater treatment plants, landfills, and their surrounding communities.	+ Physical health/improved air quality - Safety Risks - Technology Lock-in
2. Expand regulatory requirements for food waste recycling and diversion	NJ will explore expanding requirements such as lowering the current food waste recycling regulatory threshold for large generators from 52 to 25 tons and requiring all food waste generating businesses in the state to reduce or divert some percentage of their annual food waste through a combination of reduction, donation, composting or sending to recycling facilities	This measure would impact owners of businesses (e.g., restaurants) that generate large amounts of food waste and could provide resources to local communities. The goal of this measure is to avoid landfilling, so that means sending materials to feed people (donations), to be composted, or to be sent to authorized food waste recyclers (including those listed here on NJDEP's website). Landfilled food waste generates methane emissions, which contributes to global climate change. Decreasing methane emissions would contribute to mitigating the risks of climate change. Diverted food that is eaten would help to feed food-insecure portions of the population statewide.	+ Physical health/improved air, soil, and water quality + Mental Health - Emissions - Physical Health (exposure to improperly handled materials) - Mental Health - Financial Resilience - Capacity to store food
3. Apply compost to cropland and pasture	Stand up and expand programs to support the application of compost to cropland and pasture, with the goal of applying compost to 20,000 acres annually in 2050. This reduces methane emissions from landfills by diverting waste from	This measure would impact owners of businesses (e.g., restaurants) that generate large amounts of food waste and could provide resources to local communities and farmers.	+ Physical health/improved air, soil, and water quality - Physical Health (exposure to improperly handled materials)

	decomposing in landfills (an anaerobic environment).		
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Measure 1: Reduce methane leaks from landfills and wastewater treatment plants via more stringent regulations.

- **Qualitative Benefits**

o Physical Health

- Landfill gas is a mixture of methane (45-60%), carbon dioxide (40-55%) and trace amounts of other components ([Wang 2014](#)). Methane is a precursor to tropospheric ozone ([Butler et al. 2020](#)), tropospheric ozone can have a negative impact on human health by causing asthma, reduced lung function, and chronic obstructive pulmonary disease ([Mar et al. 2022](#)). A recent study found that in 2010, 1.0-1.2 million respiratory deaths in adults worldwide were attributable to ozone exposure ([Malley et al. 2017](#)). Reducing methane leaks from landfills would help to mitigate these health issues.
- Wastewater treatment plants and sewer networks are the fifth largest source of anthropogenic methane emissions in the world and represent 7-9% of total global methane emissions into the atmosphere ([Khabiri et al. 2021](#)). Methane oxidizing bacteria (MOB) is one tool in the WWTP toolbox that can contribute to nitrogen removal, resource recovery and emerging contaminants removal while also converting methane to carbon dioxide and mitigate the GHG emissions ([Wang et al. 2021](#)). Airborne bacteria and endotoxins, which can occur in tandem with methane emissions, can cause WWTP workers to experience respiratory hardship and diarrhea ([Lu et al. 2020](#)).
- Using landfill gas and anaerobic digestion to replace natural gas usage at landfills and WWTF would decrease demand for natural gas as well as the disbenefits associated with extracting, transporting, and utilizing natural gas.

- **Qualitative Disbenefits**

o Proper implementation of methane mitigation measures is necessary

- Anaerobic technologies are moving to mainstream as they hold good potentials of energy savings and methane resource recovery, but their development and deployment need to be carefully designed and carried out with close monitoring, minimized GHG leaking, and optimized energy and resource recovery without loss ([Song et al. 2023](#))

o Technology Lock-in

- Committing to a new WWTP process or technology can be expensive for WWTPs which, historically, has led to the dominance of historic technologies that perpetuate economic and environmental inefficiencies ([Garrido-Baserba et al. 2024](#))

o Safety Risks

- Anaerobic digesters can cause physical harm to workers if the system is not maintained properly or if workers do not utilize the proper safety equipment and protocols. Such health risks include burns (digesters have hot engine blocks, exhaust pipes, and hot water/steam pipes that could cause burns if touched), biogas leaks (which can cause explosions or spillage), fire (smoking near a digester can create a risk of ignition or sparks), and noise pollution (noise from the digester can cause discomfort depending on exposure: short term exposure could cause discomfort, long term exposure could cause temporary or permanent deafness). ([PennState Extension 2025](#))

- **Recommendations to Mitigate Disbenefits**

- Implement best management practices and lessons learned from case studies regarding how to reduce methane leaks from relevant sources. Some resources are included below:
 - Armor Thane's Case Study on Sealing a Leak from an Anaerobic Digester ([Gleckler 2025](#))
 - EPA's Anaerobic Digester/Biogas System Operator Guidebook ([EPA 2020](#))
 - Safety Around Anaerobic Digesters ([PennState Extension 2025](#))
- Offer Incentive Programs to Reduce Cost of Upgrades to Landfills and WWTP
 - It is important to support a wholistic approach to landfill and WWTP upgrades with long-term planning horizons to escape the historical technology lock-ins associated with major upgrades to systems ([Stepic 2025](#); [Verstraete et al. 2025](#)). Incentive programs can help with this type of planning such as those highlighted by the EPA (available [here for landfills](#) ; and [here for WWTP](#)) and elsewhere.

Measure 2: Increase the number of organizations (1) required to recycle food waste and (2) reduce the amount of food waste. Waste generated can instead be used for donations, compost, or sent to Authorized Food Waste Recycling Facilities.

- Qualitative Benefits

- Physical Health
 - Reducing food waste can reduce the production of food which can lead to reduced soil, water, and air quality degradation from the process of transporting, incinerating, recycling, and landfilling waste ([Zamri et al. 2020](#)) which, in turn, can improve physical health.
 - Access to healthy food improves physical health and reduces chronic diseases. ([Rudolph et al. 2018](#), [An et al. 2019](#))
 - Anerobic digestors reduce the volume of sludge sent to landfills for disposal because (1) the volume of sludge produced at an anerobic digester is significantly reduced compared to a traditional WWTP (which is where the vast majority of sludge currently ends up from New Jersey WWTPs) and (2) WWTP typically take in additional organic material from outside sources (which would otherwise go to a landfill). This reduces GHG emissions and co-pollutants from the transport and decomposition (*e.g.*, methane, chromium (VI), zinc, nickel, and arsenic, via [Wang et al. 2021](#)) of sludge which improves local air quality and has positive health impacts.
- Mental Health
 - If anerobic digestors are used at WWTFs, evidence suggests an improved quality of life for local communities from reduced smell ([Kitson et al. 2019](#), [Zhang et al. 2020](#)) If digestors are not integrated into waste management stream properly, smell can increase for local communities.
 - There are opportunities to foster community cohesiveness in the world of food security and energy generation. For example, if the sludge generated from digestors at a wastewater treatment facility could be shared with local organizations, like a community garden program, where the garden may receive free sludge/fertilizer for their garden. However, it is likely the wastewater treatment facility would prefer to sell the processed sludge for a profit, rather than donating to the local community

- Qualitative Disbenefits

- Emissions
 - Refrigeration and transport of food for donation will generate some emissions.
- Physical Health

- Poorly maintained compost operations can attract wildlife, promote conflict with people, and potentially spread diseases ([Murray et al. 2016](#)). But small-scale composting (among other techniques) rather than commercial scale composting is more viable for urban environments ([de Souza Lima Jr. 2020](#))
 - If we assume neighborhoods that have truck traffic from wastewater treatment facilities also have traffic from other large trucks, we can assume that the reduction of wastewater treatment facility truck traffic would not fully ameliorate the full scope of the truck traffic nor the health/noise problems they cause.
 - Digestate from anaerobic digesters can be used as a soil conditioner, however, the digestate needs to undergo proper treatment to ensure the soil is not contaminated and harm people. This could increase the overall cost of the anaerobic digestion process ([Kumar and Samadder 2020](#)).
 - Mental Health
 - Construction noise from building digestors and noise from increased traffic to industrial compost facilities may be disruptive to local communities.
 - Financial Resilience
 - Manure can be used as a source of electricity, but policies that relate to selling this renewable electricity to the grid varies among states which may disadvantage producers in some states ([Lim et al. 2023](#)) and cause increased costs to consumers ([Lim et al. 2023](#)).
 - Capacity to Store Food
 - To support an increased food supply into a food recovery system, food pantries may need refrigerators and similar equipment to accommodate increased food stocks and to ensure they are able to stock higher quality food, distribute food, and thus reduce food insecurity. Food storage methods should be able to support daily food distribution events and should be able to feed local communities during climate emergencies. Backup generators will be important to ensure food lasts longer during natural disasters or other climate events (e.g., urban heat island power outages). All of this would come at increased cost which could be a barrier to implementation.
- **Recommendations to Mitigate Disbenefits**
 - Emissions
 - It will be important to ensure sustainable refrigeration options are implemented, at that low-emissions vehicles are utilized, to minimize the carbon footprint of food donation.
 - Physical Health
 - Follow state and federal laws to minimize wildlife and other negative impacts of commercial composting from occurring.
 - Engage Stakeholders and Existing Resources
 - Engage community members and other stakeholders early and often in the WWTP and landfill upgrades process to ensure changes are supported by relevant parties. Tips for engaging stakeholders have been recorded by Ko et al. ([2025](#)), RACO ([2025](#)), and Sustainable Directory ([2025](#)), to name a few.
 - Thinking big picture and wholistically about the transport and accessibility of food waste to all communities is imperative. Resources generated by Brown et al. ([2022](#)) and data provided by Guran et al. ([2023](#)) could serve as important foundational documents to implement this measure.

- Stakeholder Input
 - Stakeholders expressed support for residential composting/streamlined permitting process.
 - “We recommend leveraging the Zero Food Waste Coalition’s State Policy Toolkit, which provides examples of policies and actions that can be incorporated into climate action plans to keep food waste out of landfills and reduce associated landfill methane emissions. Together, we can make a significant impact on the reduction of greenhouse gas emissions and the improvement of our state’s overall sustainability.”
 - “Policies and programs that disincentivize food from being landfilled or incinerated (such as food donation or recycling mandates) incentivize greater food waste prevention, while new infrastructure (such as food rescue, food hub, or composting facilities) help businesses and communities donate, upcycle, and recycle more of their excess food. These actions additionally support new jobs, help businesses and individuals cut their food purchasing costs, alleviate food insecurity among low-income and disadvantaged communities, and mitigate the longstanding environmental justice impacts of landfills and incinerators on local communities.”

Measure 3: Divert food waste from landfills by applying it to agricultural fields.

- Qualitative Benefits

- Physical Health
 - Composting (or aerobic digestion) coupled with “waste-to-energy” (WTE) recovery efforts are economically favorable methods of treating food waste and manure on a large scale in New Jersey due to the small space needed to build a facility, environmental benefit, and positive impact (*e.g.*, nutrient supply) on New Jersey’s farmland. Composting within a WTE system generates a pathogen free source of organic nutrients to enhance soil fertility. This measure mitigates methane which would be produced by food waste in landfills. Traditionally manure is disposed of by dispersing it onto farmland as a soil amendment which can create negative human health (*e.g.*, pathogens in untreated manure can cause human illness and infectious diseases) and environmental (*e.g.*, untreated manure smells and can cause groundwater contamination) issues. This measure provides these human health benefits (*e.g.*, precluding human illness/infectious diseases, improved smell from farms, clean groundwater) ([Wang 2014](#)) as well as the health benefits of reduced CO₂ and other GHG into the atmosphere.
 - Landfill gas is a mixture of methane (45-60%), carbon dioxide (40-55%) and trace amounts of other components ([Wang 2014](#)). Methane is a precursor to tropospheric ozone ([Butler et al. 2020](#)), tropospheric ozone can have a negative impact on human health by causing asthma, reduced lung function, and chronic obstructive pulmonary disease ([Mar et al. 2022](#)). A recent study found that in 2010, 1.0-1.2 million respiratory deaths in adults worldwide were attributable to ozone exposure ([Malley et al. 2017](#)). Diverting food waste from landfills and transforming it into biofertilizer reduces the environmental impact of food waste, improves nutrition levels of the soil, and decreases the requirements for synthetic chemical fertilizer ([Du et al. 2018](#)).

- Qualitative Disbenefits

- Physical Health
 - Improper use of composted manure can have negative effects such as air pollution from greenhouse gas emissions, contamination of surface and groundwater by nitrates and phosphates, and reduced crop yield ([Goldan et al. 2023](#)).

- Some methods of generating biofertilizer (e.g., chemical hydrolysis and direct burning) can be energy intensive, release harmful gases into the atmosphere, and introduces increased opportunity for soil diseases ([Du et al. 2018](#)).
- ***Recommendations to Mitigate Disbenefits***
 - Consider the opportunities to increase food security and reduce New Jersey’s organic waste using the “Advancing the New Jersey Sustainable Organic Material Management Plan” ([Rutgers 2022](#)).
 - Utilize proper treated manure application techniques to avoid negative human and environmental health impacts. This includes improved process control strategies, strict quality controls, development of a smart product distribution system, and adoption of advanced (clean) technologies ([Du et al. 2018](#)).

F. Natural Gas Transmission and Distribution Sector

A summary of information regarding each measure under this sector is provided in the table below. Details regarding the Benefits, Disbenefits, and Recommendations to Mitigate Disbenefits can be found below the table.

CCAP Measure	Description	Direct Impacts/Changes	Summary of Impacts
1. Implement a mandatory emissions reduction program for natural gas T&D systems	Enhance leak detection monitoring, require natural gas companies to improve the response times for addressing leaks, and implement a mandatory emissions reduction program for natural gas T&D systems	This measure would impact anyone living, working, or visiting buildings in New Jersey that are supplied by natural gas. The natural gas network includes gas pipelines that transmit natural gas across state borders and within neighborhoods, it can be stored underground to maintain system pressure (stored in depleted natural gas fields, salt caverns, depleted aquifers) (US Energy Information Administration 2024) Leaks can occur across the natural gas pipeline – gas wells, gas gathering pipelines, gas processing plant, commercial and residential users’ pipes and meter on buildings (The Gas Index 2020) Improved leak detection and repair times could reduce exposure amounts and duration of the population/environment.	+ Physical health/improved air quality + Energy Security - Physical health/worker safety
2. Stop the expansion of natural gas T&D infrastructure and introduce non-pipeline alternatives	Implement incentives to convert portions of the natural gas systems to thermal energy networks and develop tools to help with building electrification plans, like a distribution hosting capacity map or gas system planning tools	This measure would impact anyone living, working, or visiting buildings in New Jersey that are supplied by natural gas or their supply pipelines. A thermal energy network (TEN) is a system that distributes heating and cooling to multiple buildings using a network of underground pipes – in this system, buildings can exchange heat with lakes/rivers/energy-intensive buildings/wastewater systems/stable temperature of the earth)	+ Physical health/improved air quality + Financial Security + Workforce Development - Physical health/air pollution - Quality of life (noise pollution, expense, infrastructure disruptions) - Financial Security

Measure 1: Protect natural gas pipelines from leaking from gas well, to gas processing plant, to commercial and residential users.

- **Qualitative Benefits**

- Physical Health Benefits from avoided co-pollutant exposure such as:
 - Natural gas and petroleum production and transport in the United States is the second largest emitter of methane (*e.g.*, 7.05 million metric tons in 2018) ([Allen 2014](#), [Tavakkoli et al. 2022](#), [Buonocore et al. 2023](#))
 - PM_{2.5}, PM₁₀, NO₂, volatile organic compounds (VOCs), and ozone which are emitted or produced as a part of the natural gas production and transport process have several negative health impacts including the following using data from 2016 and reported using the “cases (95% confidence interval)” nomenclature for the United States ([Buonocore et al. 2023](#)). It is generally accepted that negative health impacts are most concentrated in areas where oil and gas are produced, but Buonocore et al. 2023 found notable spread of negative health impacts outside of those major oil and gas production areas:
 - Premature Deaths - caused by PM_{2.5}, NO₂, and ozone: 7500 (4,500-12,000)
 - Asthma incidence – caused by PM_{2.5} and NO₂: 220(830-3,200)
 - Asthma hospitalizations - caused by PM_{2.5} and NO₂: 53(1.2-110)
 - Asthma emergency room visits - caused by PM_{2.5} and NO₂: 530(12-1,100)
 - Asthma exacerbations - caused by PM_{2.5} and NO₂: 410,000(9,200-810,000)
 - Respiratory hospitalizations - caused by PM_{2.5} and ozone: 1,500(550-2,400)
 - Heart attacks - caused by PM_{2.5} and NO₂: 270(150-390)
 - In residential homes, malodorants (*e.g.*, organosulfur compounds) added to natural gas to aid in leak detection can themselves cause negative health impacts such as: headache, ocular irritation, nose and throat irritation, respiratory issues such as shortness of breath and asthma attacks, as well as skin irritation and rash ([Michanowicz et al. 2023](#))
 - The transportation of natural gas through natural gas pipelines has caused the following negative health impacts in the eastern United States between 2010-2019: 118 incidents (*e.g.*, leaks, fires, explosions), 2 injuries, an estimated \$1.48 million in property damage. ([Anderson 2020](#))
 - Compressor stations pressurize natural gas every 50-100 miles along pipeline routes in the United States but can cause air pollution. Exhaust from combustion within the compressor units is the major source of air pollution and emits chemicals including: VOCs, nitrogen oxide compounds (NO_x), and particulate matter. These co-pollutants can cause harm to human respiratory, cardiovascular, and neurological health and can increase human mortality rates. NO_x and VOCs are precursors to ozone which can aggravate respiratory conditions like asthma ([Davis et al. 2023](#)) Of note is that ozone is one of EPA’s six criteria pollutants and the only pollutant NJ is not currently in attainment for ([NJDEP 2025](#)).
 - Transmission pipeline natural gas (*i.e.*, gas after it has been processed and is being sent to commercial and residential units) can contain benzene, toluene, ethylbenzene, xylenes, hydrogen sulfide, and mercury. Transmission pipelines release natural gas during uncontrolled leaks and during routine operations ([Nordgaard et al. 2022](#)), and additional research is needed to see if the concentrations of these pollutants in natural gas pipelines are associated with human health impacts.
- Greater Energy Security

- Gas leaks in the pipes and valves for the transmission and distribution of natural gas can be expensive to repair, but the cost of repairing leaks is less than the value of gas saved through the leak. This also mitigates the likelihood of system upsets and unplanned shutdowns should leaks become worse. ([EPA 2017](#))
- **Qualitative Disbenefits**
 - Risk to Physical Health
 - Working with natural gas comes with some risk of leaks, fires, and explosions due to the combustible nature of the gas. Additionally, there is a risk of potential carbon monoxide poisoning from improperly vented appliances in a home or commercial property.
- **Recommendations to Mitigate Disbenefits**
 - Follow proper safety protocols including those highlighted in the resources below:
 - Guidance Manual for Operators of Small Natural Gas Systems ([USDOT 2017](#))
 - DOT's Pipeline Safety Final rule ([USDOT 2021](#))
 - Gas Appliances and Gas Piping Manual ([PSEG 2024](#))
 - Consider a polluter pays principle – in the event of an incident on a natural gas pipeline, a polluter pays principle would remove the need for costly litigation over compensation for damages were a natural gas pipeline to experience an incident ([Anderson 2020](#)) and could expedite projects to mitigate any natural gas pipeline incident.

Measure 2: Stop natural gas from expanding and turn the natural gas infrastructure into thermal energy networks

See [Measure 1 from “Residential and Commercial Buildings”](#) for the full scope of qualitative benefits, qualitative disbenefits, and recommendations to mitigate disbenefits in addition to those below.

- **Qualitative Benefits**
 - Physical Health
 - Thermal energy networks (TENs) provide emissions reductions, equitable delivery of heating and cooling, reduced grid buildout, and cost savings to consumers ([Camargo et al. 2024](#)). The added benefit over heat pumps which service individual buildings, is that TENs offer an opportunity for neighborhood-scale decarbonization solutions ([Camargo et al. 2024](#)).
 - Workforce Development
 - TENs can be built using gas utility workforce including construction experts and customer service/billing. Workers who currently install and repair gas pipes can transfer their skills to similar thermal energy pipes. This is advantageous because it can increase the speed at which TENs are implemented (e.g., utility companies have legal rights-of-way and access to capital financing that might not be available on this scale elsewhere). ([Camargo et al. 2024](#))
- **Qualitative Disbenefits**
 - Quality of Life
 - Installation of TENs will require pipes and other infrastructure be installed underground as well as inside buildings and above ground ([VCTN 2025](#)). This could cause disruptions to community roadways for extended periods of time, making it difficult to navigate around road closures and temporary damage to roadways (e.g., potholes).

- Financial Security
 - TENs require a significant up-front investment which can be recovered by ratepayers over a span of 50-60 years ([Camargo et al. 2024](#)). While some of this can be recuperated via community savings in maintenance, energy, and replacement costs ([Anderson 2023](#)), it does not reach the full cost of the up-front investment. Fewer than ¼ of states provide owner-operator credits to help cover the costs of installation ([Fry et al. 2024](#)).
- **Recommendations to Mitigate Disbenefits**
 - Reduce Regulatory Hurdles
 - Investigate groundwater, mineral and petroleum, or public service monopolization laws that could be hindering the development of UTES ([Fry et al. 2024](#)).
 - Create Incentive Programs and Implement Interdisciplinary Planning for TEN Installation
 - Zoning bonuses or incentives can help real estate developers create more housing units that can support TEN development and reduce overall costs in installation ([VCTN 2025](#)).
 - Encourage municipalities to coordinate TEN plans as it advances other infrastructure work like stormwater drainage or roadway work to reduce costs and disruptions to local communities ([VCTN 2025](#)).
 - Encourage households/businesses to prepare buildings for TEN infrastructure during other construction processes which, in turn, will also enhance TENs' ability to function efficiently (*e.g.*, when building is weatherized, when electric capacity is upgraded, when replacing an aging heating system) ([VCTN 2025](#)).
 - Engage Communities to Begin Planning
 - Low public interest and trust in thermal energy can be mitigated by improved education and awareness regarding the benefits of TENs ([Fry et al. 2024](#)). Public trust and engagement will be key in engaging communities in large scale planning efforts that will impact their homes and businesses. Consider following the guidance/toolkit established by the Vermont Community Thermal Networks and Energy Action Network as a starting point ([VCTN 2025](#)).

G. Halogenated Gases Sector

A summary of information regarding each measure under this sector is provided in the table below. Details regarding the Benefits, Disbenefits, and Recommendations to Mitigate Disbenefits can be found below the table.

CCAP Measure	Description	Direct Impacts/Changes	Summary of Impacts
1. Implement a refrigerant management program	Require facilities with chillers and/or refrigeration systems using 50 lbs or more of a high-GWP (150 GWP or more) refrigerant to conduct and report periodic leak inspections; promptly repair leaks; and adopt service practices to reduce emissions of refrigerants.	This measure could impact commercial operations or manufacturing plants of industrial and commercial refrigeration systems.	+ Physical health/improved air quality + Workforce Development - Physical health/worker safety

2. Implement a refrigerant replacement incentive program	Expand existing pilot incentive programs such as NJ Cool, to support businesses, institutions and local governments, especially those in low- and moderate-income communities, to upgrade their systems with low and ultra-low GWP refrigerants.	The process of replacing refrigerants would require workers to potentially be exposed to toxic (and flammable) chemicals from industrial facilities and then dispose of those materials in a sustainable manner. Refrigerant handling and disposal are highly regulated to ensure the safety of both the environment and workers, many of which live in economically vulnerable communities. However, there is always a risk of harm to individuals handling these chemicals. As such, the positive impacts to communities are low because there would be a limited number of individuals who may be exposed to toxic and harmful refrigerant chemicals, even in the unlikely event that safety protocols are not followed during the transition to low-GWP refrigerants. The positive impact is also low because any energy savings from switching from high-GWP to low-GWP refrigerants would be realized by the owners of industrial facilities not the communities themselves.	+ Physical health/improved air quality + Workforce Development + Decreased Energy costs - Physical health/exposure to harmful materials
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Measure 1: For facilities with large AC and refrigeration systems, ensure those systems are working properly and don't have leaks that would release into the atmosphere refrigerants with high-global warming potentials.

- Qualitative Benefits

○ Physical Health

- Large AC and refrigeration systems are installed in industrial and commercial settings where climate control or cold storage are critical for operations. This includes refrigeration for the processing and production of food and beverages, warehouses/distribution centers/transportation systems that maintain the integrity of the cold supply chain, biopharmaceuticals ([Camp 2021](#)) and more. Commercial refrigeration systems usually have a single compressor which circulates the refrigerant and maintains a desired temperature (typical refrigerant is a hydrofluorocarbon, or HFC), while industrial refrigeration systems have multiple compressors (typical refrigerants are ammonia, carbon dioxide, HFCs) ([PartsFE 2023](#)). Industrial facilities in New Jersey report usage of various HFCs as well as some legacy CFCs and HCFC ([National Refrigerants Inc. 2020](#)).

○ Workforce Development

- Industrial refrigeration systems are more complex and require more frequent maintenance ([PartsFE 2023](#)). This could provide many long-term, good paying jobs for trained technicians. Especially as employment of heating, air conditioning, and refrigeration mechanics and installers are projected each year, on average, to add 40,100 jobs nationwide between 2024 and 2034: this is much faster than the average for all occupations ([US Bureau of Labor Statistics 2025](#)).

- Qualitative Disbenefits

- Physical Health

- Ammonia is a corrosive material and could corrode metal parts of a refrigeration system (e.g., aluminum, copper) and cause leaks. Ammonia that combines with air becomes combustible and may cause a fire or explosion which, in turn, could harm individuals in or near the combustion zone ([Khudhur et al. 2022](#)).
- Ammonia can cause asphyxiation. The permissible exposure level set by OSHA is 50 ppm over an 8 hour exposure, however, the National Institute for Occupational Safety and Health has identified exposure to 300 ppm of ammonia causes an immediate danger to life and health ([Khudhur et al. 2022](#)).
- When inhaled, some HFCs can cause a reduced breathing rate and salivation, slightly lower food consumption and weight gain, slight focal interstitial pneumonia, and mild chronic irritation in the lung. ([Chele et al. 2024](#)).
- Natural refrigerants can cause a variety of potential health effects including these: cardiac sensitization (propane); severe damage to the eyes, nose, throat, and respiratory tract (ammonia); and respiratory arrest and unconsciousness (carbon dioxide) ([Chele et al. 2024](#)).
- The reaction of HFOs and HFCs with OH radicals in the atmosphere can yield products of varying persistence and toxicity. This includes TFA which is an ultra-short per- and polyfluoroalkyl substance (PFAS) which are highly persistent in the environment and whose long-term effects on human health in the environment are uncertain ([Chele et al. 2024](#)). Some research does suggest, however, that exposure to some PFAS chemicals is associated with some negative health effects such as increased risk of some cancers ([EPA 2025](#); [ATSDR 2025](#); [Fenton et al. 2020](#)).

- **Recommendations to Mitigate Disbenefits**

- Refrigerants are harmful to human health and the environment. Proper safety protocols should be used when implementing this measure to avoid acute and chronic health impacts from exposure to refrigerants or their byproducts. In addition, refrigerant management programs reduce emissions of refrigerants, which will help to reduce possible health impacts from human exposure to them.

Measure 2: Replace high global warming potential refrigerants with low GWP refrigerants at facilities with large refrigeration systems.

- **Qualitative Benefits**

- Physical Health
 - See benefits for Measure 1 above, “Physical Health.”
- Workforce Development
 - Replacing high global warming potential refrigerants would provide entry level mechanic position which are expected to grow in the next decade ([US Bureau of Labor Statistics 2025](#)). If job opportunities are limited after the transition to low-global warming potential refrigeration systems is completed, then long-term job opportunities would be most likely be available if there was a job training element to keep those new employees on the job to do other work/repair/maintenance on refrigeration systems or other appliances.
- Decreased Energy Costs
 - Phasing down HFCs could save users on electricity costs if done properly ([Purohit et al. 2020](#))

- **Qualitative Disbenefits**

- Physical Health
 - Accidental spillage/leakage from refrigerators and recyclers of electronic appliances are the major sources of HFCs emissions for humans ([Tsai 2005](#)). This can make individuals who repair, transport, or dispose of appliances particularly vulnerable to the harmful impacts of HFCs on human health because they are disproportionately close to HFCs leaks and get higher exposure.
 - Certain low-GWP HFCs can be dangerous beyond their toxicity – for example, some HFCs are flammable ([Bolaji 2013](#), [Kumma and Kruthiventi 2024](#)).
 - While OSHA protections are in place, sometimes worker safety/health is not always protected in the workplace. Moreover, individuals from OBC or AIOBC are likely the employees who would be replacing the refrigerants. As such, OBC and AIOBC may be disproportionately impacted by toxins when the State makes the shift to low-GWP refrigerants.
- ***Recommendations to Mitigate Disbenefits***
 - Follow mandated safety protocols while handling hazardous/toxic materials.
 - Reduce leakage emissions of halogenated gases.
 - Educate businesses and workers on safety and preventing exposure to halogenated gases.

H. Natural and Working Lands – Carbon Sequestration

A summary of information regarding each measure under this sector is provided in the table below. Details regarding the Benefits, Disbenefits, and Recommendations to Mitigate Disbenefits can be found below the table.

CCAP Measure	Description	Direct Impacts/Changes	Summary of Impacts
1. Strengthen and expand existing natural carbon sinks through reforestation, afforestation, and restoration, to at least 10 MMT CO ₂ e/year.	NJ will take a series of policies and actions that will maintain, restore and expand its natural and working lands that act as natural carbon sinks. These enabling actions may include: - create and expand statewide land acquisition programs that ensure conservation and low/negative carbon land uses (such as Blue Acres and Green Acres programs for acquisition of private land for conservation). - Implement policies and incentives to increase the ability of lands to offset GHGs and land management / sequestration of carbon,	This measure would increase the amount of green space for all New Jersey residents including those living in or visiting rural, suburban, and urban environments.	+ Physical health/improved air and water quality + Mental Health + Mental Acuity + Increased resilience + Improved Energy Security + Infrastructure Protection + Workforce Development Opportunities - Installation and management costs - Physical Health (from illegal dumping, ecological changes) - Quality of life (noise pollution, expense, infrastructure disruptions)
2. Protect, maintain, and avoid the conversion of natural lands, including 21,000 acres of forested lands, through high-carbon land acquisitions and policies that promote location-efficient development	NJ will create new or expand existing programs such as Green and Blue Acres to avoid the conversion of or acquire on average at least 840 acres of additional forested lands annually which may then be used as public parks, forests and wildlife areas that prevent them from being converted into non-forest, (higher emission) uses. Note: This number is the estimated annual rate of acres derived from the NJ NWLS target of avoiding at least 21,000 acres of forested lands from being converted to non-forest used by 2050. Note: Enabling actions also include, afforestation, reforestation of degraded forests, avoiding deforestation, wetland restoration (salt marsh restoration and tidal reconnection projects, installing living shorelines), submerged aquatic vegetation (SAV) conservation and restoration, planting cover crops on pasture lands, redevelop brownfield sites into parks, and afforestation of urban spaces (plant 1 million street trees/shade trees).	This measure would increase the amount of green space for all New Jersey residents including those living in or visiting rural, suburban, and urban environments.	+ Physical health/improved air and water quality + Mental Health + Mental Acuity + Increased resilience + Improved Energy Security + Infrastructure Protection + Workforce Development Opportunities - Installation and management costs - Physical Health (from illegal dumping, ecological changes) - Quality of life (noise pollution, expense, infrastructure disruptions)

Measure 1-2: afforestation, reforestation of degraded forests, avoiding deforestation, wetland restoration (salt marsh restoration and tidal reconnection projects, installing living shorelines), SAV conservation and restoration, planting cover crops on pasture lands, redevelop brownfield sites into parks, and afforestation of urban spaces (plant 1 million street trees/shade trees)

- **Stakeholder Input**

- The state should develop climate-smart land use planning criteria and mandate that planning boards and zoning boards evaluate land use applications based on criteria.
- Reverse state policy that prevents Indigenous people (and other New Jerseyans) from foraging on the land
- We need more nurseries or expanded State tree nurseries as well as changes to current policies that restrict the sale of native fruit trees from NJ tree farms to non-commercial buyers.
- We have concerns around the lack of oversight and regulatory enforcement addressing environmental harms to local air, water, and public health from large farming operations in South Jersey.
- Remove legal restrictions and regulatory hurdles that prevent people from growing their own food, whether that be in community farms, on their lawns, or smaller-scale farms.
- Increase access to capital for historically underrepresented groups to purchase land and become farmers and producers.
- We want the State to reform Brownfield redevelopment policies that currently disincentivize infill development and/or place additional burdens on NJ OBCs, such as requirements around cleanup assessment fees and initial assessments.
- We want some State regulatory or legislative actions to limit the ability of local planning boards to make exceptions to zoning ordinances, regarding warehouse development approvals, without extensive consideration of climate impacts especially in residential areas.

- **Qualitative Benefits**

- Tree Planting
 - Physical Health
 - Reduced air pollution.
 - Urban trees that are planted in a high biodiversity pattern (with different tree species adjacent to one another) are associated with lower mortality rates for heart disease and stroke. The authors stress that correlation does not mean causation, but this could be a cost-effective way to reduce mortality related to cardiovascular disease in urban areas ([Giacinto et al. 2021](#))
 - Living in urban areas with more green spaces was associated with improved cardiovascular health in people free of acute myocardial infarction and heart failure but not among individuals who have already developed these conditions ([Chen et al. 2020](#))
 - Prenatal and perinatal exposure to air pollutants can cause respiratory diseases in children and adults ([Kim et al. 2018](#)). Exposures to air pollutants at a young age are strongly associated with asthma exacerbations in children ([Tosca et al. 2014](#)). Urban forest environments seem to help protect children from respiratory morbidity (e.g., wheezing, sneezing, runny nose, itchy eyes) ([Almeida et al. 2020](#)).
 - Reduced heat illness, as trees reduce frequency of heat island events ([Rudolph et al. 2018](#), [Lungman et al. 2023](#))
 - Faster recovery from illness (because of reduced stress)
 - Reduced gun violence – fewer gunshot assaults have been found in areas of high tree coverage. It is also important to design landscaping with “Crime Prevention Through Environmental Design” techniques in mind (e.g., reduce shrubbery to improve sightlines and sense of security) ([Wolf et al. 2010](#), [Kondo et al. 2017](#), [Lee 2021](#), [Nuccitelli et al. 2023](#))
 - Cancer protection - trees can reduce the risk of skin cancer due to shade protection ([Moreno et al. 2015](#))

- Mental Health
 - Stress reduction and social cohesion (sense of safety, beauty) – social cohesion also reduces premature deaths because individuals feel connected to their communities. ([Vincent et al. 2017](#))
- Improved Mental Acuity
 - Prevalence of trees in urban environments is associated with improved academic performance in school aged children ([Sivarajah et al. 2018](#))
- Increased Resilience
 - Planting trees provides a cooling effect in urban environments which decreases urban heat island ([Kondo et al. 2020](#))
- Improved Energy security
 - Shade extends life of building materials ([Vincent et al. 2017](#)) and reduces energy bills.
 - Trees are a wind break and might help heating bills (but windbreaks are only effective in saving energy in windy climates per Dewalle and Heisler ([1988](#)))
- Living shorelines and stream restoration initiatives benefit New Jersey in a myriad of ways which are highlighted in detail at [Spector et al. 2025](#), below are a few highlights:
 - These projects can provide organic materials for harvesting, improved water quality, air quality improvement, climate regulation, and carbon sequestration, all of which can improve human physical and mental health.
 - These projects can provide infrastructure protection and erosion control which can protect our built infrastructure along the coast and along riverine ecosystems.
 - These projects provide pollinator services and nutrient cycle control which improve humans’ recreational experiences on New Jersey’s coastline.
 - These projects provide green space which also provides cultural benefits such as educational opportunities and promotes a sense of place or “cultural value” to a local community.
- Marsh protection, restoration, and enhancement benefits are highlighted in detail at [Spector et al. 2025](#); below are a few highlights:
 - Salt marshes improve local water quality and sequester carbon which can be beneficial to human health.
 - Salt marshes provide protection from erosion and provide protection to infrastructure.
 - Salt marshes provide food and habitat for a diverse ecosystem of flora and fauna which improve humans’ recreational experiences (kayaking, fishing, hiking) along New Jersey’s coastline.
- Planting cover crops is a form of conservation agriculture which has a myriad of benefits highlighted in detail at [Spector et al. 2025](#); below are a few highlights:
 - Improved water quality from conservation agriculture increases opportunities for recreation and improved human health. Cover crops also provide soil health improvements which reduce ammonia and nitric oxide emissions.
 - Conservation agriculture provides air quality improvements by reducing dust and PM_{2.5} pollution.
 - Cover crops contribute to carbon sequestration which protects humans from climate related health hazards.

- Cover crops can create healthier ecosystems which provide a buffering capacity against natural and anthropogenic disturbances and produce crops for market.
 - Cover crops increase the aesthetic appeal of farmlands, which provide aesthetic value and green space outside of the usual growing season ([Yan et al. 2023](#)).
- Redeveloping Brownfields into parks is an example of creating green space in urban, suburban, and rural environments. The benefits of this type of project are highlighted in detail at [Spector et al. 2025](#); below are a few highlights:
 - Physical Health
 - Preserved open space provides low-cost or free recreational opportunities to residents and promotes health and wellbeing. Parks and preserves throughout the state offer hiking, biking, birding, dog walking, paddling, fishing, horseback riding and more. Physically active people who use outdoor open spaces have lower incidences of cardiovascular diseases, diabetes, depression, certain cancers, and obesity ([NJ Conservation Foundation 2024](#)).
 - Open space in Mercer County, NJ encourages residents to engage in outdoor recreation and become more physically active. It is estimated that moderate and strenuous activity of visitors to the open space in the county avoids \$84.1 million in medical costs annually ([ESI 2021](#)).
 - Green parks and spaces remove pollution from the air, can mitigate urban heat islands, and can provide carbon sequestration to mitigate future harmful impacts of climate change.
 - Green parks and spaces can uptake nutrients and runoff to protect aquatic ecosystems and coastal environments from pollution and extreme water levels which could be harmful to human health and infrastructure.
 - Mental Health
 - Experiencing nature at parks and open spaces provides a feeling of peace and serenity, boosting mental health. It is estimated that activities on protected open space account for millions of dollars in avoided medical costs annually, plus millions more in avoided losses from reduced productivity at work ([NJ Conservation Foundation 2024](#)).
 - Well-designed green spaces in urban and suburban environments provide aesthetic beauty and stress reduction ([Wang et al. 2019](#); [Ma et al. 2020](#)). Aesthetic beauty can translate to increased property values for homeowners.
 - Property values increase when located near protected open space as buyers are willing to pay more for properties near and adjacent to green spaces. ([Keep it Green 2019](#), [NJ Conservation Foundation 2024](#)).
 - The average home value increases 16% when it is located within 1,500 feet of natural areas. ([Lutzenhiser et al., 2001](#)).
 - The average home value increases 8-10% adjacent to parks (within 500-600 feet) and community-size parks greater than 40 acres (within 2,000 feet). ([Crompton and Nicholls 2019](#)).
 - Creation of Workforce Development Opportunities
 - Open space in Mercer County, NJ avoids \$65.2 million in lost productivity costs annually by local businesses ([ESI 2021](#)).
- **Qualitative Disbenefits**
 - Gentrification

- When neighborhoods improve from beautification, real estate prices and rents can increase causing local communities to relocate ([Nieuwenhuijsen 2020](#)).
- In some cases, homes immediately adjacent to parks did not experience this increase in the value of their home due to other negative factors (e.g., congestion, vandalism, noise, lights) ([Crompton and Nicholls 2019](#)).
- Roadblocks for Tree Planting
 - Magnitude of impact – Studies have shown that while beneficial, trees in urban environments have low potential for ameliorating air quality problems in a city environment given various social, ecological, and technological factors, including:
 - Increase in maintenance costs – trees create leaf litter which must be maintained in the fall. Trees also must be maintained (by homeowners, municipalities, or energy companies) to mitigate the threat of dead/hazardous trees and roots that damage pavement and other infrastructure ([Keeler et al. 2019](#)). ([Drew-Smyth et al. 2023](#))
 - Health– Planting additional trees may introduce pollen that can cause health problems ([Sicard et al. 2018](#)). Moreover, trees planted with poor long-term planning can reduce ventilation in cities and trap vehicle emissions at pedestrian levels and exacerbate local air pollution ([Keeler et al. 2019](#)).
 - Poor Urban Tree Maintenance
 - A study of street trees in Boston, MA found mean mortality rates of trees is double that of rural trees and has resulted in a net loss of street tree carbon storage over time ([Smith et al. 2019](#)).
- Environmental Harm which may cause physical and mental health issues as well as impacts on housing and public lands
 - *Illegal Dumping* - When public access to nature increases, so can illegal activities on that accessible land. A problem on New Jersey public lands is illegal dumping ([Howell 2022](#)): the active of dumping litter, garbage bags, tires, televisions, electronic waste, appliances, yard waste, and construction debris into natural lands. Illegal dumping can negatively impact the local environment, detracts from the natural beauty of our public lands, decreases property value, and can come with a high cleanup cost ([NJDEP 2024b](#)).
 - *Ecological Changes* - Afforestation changes the ecology of a habitat and, therefore, may cause a loss of existing ecological services on unforested land. For example, pollinators and grassland-dependent wildlife may rely on land in its current state but would be unable to thrive in a forested environment. These changes could also negatively impact threatened or endangered species, which might result in unexpected costs to local homeowners. Evaluations should be conducted to ensure this unintended consequence is avoided ([NWLS 2024](#))
- Unintended Land Use Consequences
 - Avoided conversion of NWL means other higher use development will not occur on a plot of land. This could preclude a community from a land use that could generate higher economic value such as a box store (*i.e.*, commercial development) ([Meiners and Parker 2004](#)).
- **Recommendations to Mitigate Disbenefits**
 - Utilize comprehensive and long-term planning techniques
 - Whether a project is large or small, community engagement early and often is important to ensure a natural working lands – carbon sequestration project is successful. Below are two resources to help project managers engage with community members in a meaningful way:

- 1. Appropriate Technology Transfer for Rural Areas’ How to Start Community Agroforestry Projects: Advice from 11 Forest Gardens (Favor [2023](#))
- 2. Remediating and Redeveloping Brownfields in New Jersey: A Guide for Municipalities and Community Organizations ([2021](#)) – Refer to the section on “Key Stakeholders and Their Roles”
- Tree Planting Recommendations
 - Engage Tree Experts in Planning Process
 - Identify the scale of the desired biophysical effect of planting trees to help identify i) tree species, ii) locations, and iii) the density of tree placement to achieve maximum benefits. ([Salmond et al. 2016](#), [Barwise and Kumar 2020](#))
 - Consider the aerodynamics of the desired planting area to mitigate the effects of urban street canyons ([Abhijith et al. 2017](#))
 - Plant female trees rather than male because they produce less pollen ([Sicard et al. 2018](#))
 - Establish Guidelines for Long-Term Management of Urban Trees” Initiatives to aid in the establishment and preservation of tree health are central for mitigating urban tree death and increasing street tree canopy cover such that human health benefits are realized.
- Reduce illegal dumping:
 - Continue and expand the NJDEP’s “Stop Illegal Dumping” website, which provides resources to help preclude and mitigate the impacts of illegal dumping on public land.
- Prevent Gentrification:
 - Prevent Gentrification: When the State undertakes these efforts to plant more trees, it is recommended that DEP (1) monitor the affordability of “improved” neighborhoods under this action and (2) the State take actions to ensure existing communities can afford to live in their current neighborhood if they would like to (*e.g.*, through rent control measures). Consider consulting the White Paper on Anti-Displacement Strategy Effectiveness ([Chapple and Loukaitou-Sideris 2021](#)) and Oregon’s Department of Land Conservation and Development’s Anti-Displacement and Gentrification Toolkit project resource ([Bates et al. 2020](#)).

Appendix A: Methodology Details of Calculating Co-Pollutants' Avoided Emissions

The calculation of the co-pollutants' avoided emissions for the state-wide full population in New Jersey includes the steps below. The resulting data is shown above in Section 2A, "A. Quantified Estimates of Co-Pollutant Reductions for Full Population."

1. Open and "save as" each COBRA input file to the Excel workbook format, as these files are comma delimited files.
2. Format the COBRA data in the file to be an Excel named table.
3. Filter this data for the "State" field to be limited to "New Jersey."
4. Add a field named "TierConcat" to put the 3 tiers levels into this format: 010299, with 2 digits for each tier level. Use the following formula:

=CONCAT(IF([@TIER1]<10,"0",""),[@TIER1],IF([@TIER2]<10,"0",""),[@TIER2],IF([@TIER3]<10,"0",""),[@TIER3])

5. Copy the so-modified spreadsheet's values only, to a blank tab in the input file's Excel workbook and name it with "NJ Only" in the name.
6. Copy the so-modified COBRA input file into a new Excel workbook where all further calculations on all COBRA input data files and the related tier lookup table will also be imported.
7. Import the Excel crosswalk file with the list of NEI sector/subsector tiers, a newly added "Tier Concat" column to properly format the 3 tiers into once column using the formula above.
8. In the COBRA file in the new Excel workbook, then add another field. Name this new field "MeasureLookup," and use the "XLookup" function to pull in the relevant CCAP sectors' names from the Tier crosswalk file to this new field or else to enter "not found" in the cell if the tier combination is not found in the tier crosswalk tab. Use this formula:

=XLOOKUP([@TierConcat],Table1[Tier1Tier2Tier3-CORRECTED],Table1[Which if any NJ CCAP Sector is this Relevant to?],"not found",0,1)

9. Make a pivot table of the imported COBRA file, such that the "MeasureLookup" field is a filter and the "not found" values of it are unchecked/hidden. Also, this pivot table should have the TierConcat field in the rows in column A and the names of Tier 1, Tier 2, and Tier 3 in the rows of columns B-D. Then, the sum of each of the Base and Ctrl co-pollutants should be in the column headings across many columns of the pivot table. Create a sum of the co-pollutant emissions in each Base and Ctrl column in a 2-row table above the pivot table.
10. Repeat the above steps, #1-#9 for each of the COBRA input files.
11. For the new COBRA input files, on one of the tabs of the compiled Excel analysis workbook, copy one of the existing pivot table tabs. Then change the data source to the new COBRA input file tab. Include the summary table above the pivot table and the related "MeasureLookup" filter within the pivot table in the new pivot table. Check that the cell references in the summary table are still correct.

12. Assemble a separate spreadsheet with the NEI 2020 data and related COBRA data to scale the NEI 2020 to the 2025, 2035, and 2050 BAUs and the conversion of the so-adjusted NEI BAU 2035 and NEI BAU 2050 to the CP 2035 and CP 2050, respectively. Then scale the NEI CP 2035 and NEI CP 2050 to the CCAP (DM) 2050 and CCAP (DM) 2050, respectively, based on the percentage change in the COBRA CP 2035 to COBRA CCAP 235 and change in the COBRA CP 2050 to the COBRA CCAP 2050 to create the NEI adjusted values for each scenario.

Appendix B – Detailed Tables of County Health Benefits with GHG Reduction Measures

The table below is copied from the [2025 COBRA User Manual v5.2](#) and provides a description of the health effects and their economic values. For any health benefits not listed below, please refer to Appendices C, D, E, and F of the [2025 COBRA User Manual v5.2](#) for those additional details.

Health Effect	Air Pollutant	Description
Mortality (low estimate)	PM _{2.5}	Low estimate of the number of deaths based on Wu et al. (2020)
S Mortality (low estimate)	PM _{2.5}	Low estimate of the economic value of the number of deaths, using Wu et al. (2020) and the selected discount rate
Mortality (high estimate)	PM _{2.5}	High estimate of the number of deaths based on Pope et al. (2019)
S Mortality (high estimate)	PM _{2.5}	High estimate of the economic value of the number of deaths, using Pope et al. (2019) and the selected discount rate
Infant Mortality	PM _{2.5}	Number of infant deaths based on Woodruff et al. (2008)
S Infant Mortality	PM _{2.5}	Economic value of the number of infant deaths based on Woodruff et al. (2008)
Nonfatal Heart Attacks	PM _{2.5}	Estimate of the number of non-fatal heart attacks based on Wei et al. (2019)
S Nonfatal Heart Attacks	PM _{2.5}	Estimate of the economic value of non-fatal heart attacks based on Wei et al. (2019) and the selected discount rate
Asthma Symptoms, Albuterol use	PM _{2.5}	Episodes of asthma symptoms that require Albuterol use based on Rabinovitch et al. (2006)
S Asthma Symptoms, Albuterol use	PM _{2.5}	Economic value of episodes of asthma symptoms with Albuterol use based on Rabinovitch et al. (2006)
Emergency Room Visits, All Cardiac Outcomes	PM _{2.5}	Number of cardiovascular-related emergency room visits based on Ostro et al. (2016)
S Emergency Room Visits, All Cardiac Outcomes	PM _{2.5}	Economic value of cardiovascular-related emergency room visits based on Ostro et al. (2016)
Emergency Room Visits, Respiratory	PM _{2.5}	Number of respiratory-related emergency room visits based on Krall et al. (2016)
S Emergency Room Visits, Respiratory	PM _{2.5}	Economic value of respiratory-related emergency room visits based on Krall et al. (2016)
Hospitalization, Cardio-, Cerebro-, and Peripheral Vascular Disease	PM _{2.5}	Number of hospitalizations as a result of cardio-, cerebro-, and peripheral vascular disease based on Bell et al. (2015)

Health Effect	Air Pollutant	Description
\$ Hospitalization, Cardio-, Cerebro-, and Peripheral Vascular Disease	PM _{2.5}	Economic value of hospitalizations as a result of cardio-, cerebro-, and peripheral vascular disease based on Bell et al. (2015)
Hospitalization, Alzheimer's Disease	PM _{2.5}	Number of hospitalizations as a result Alzheimer's disease based on Kioumourtzoglou et al. (2016)
\$ Hospitalization, Alzheimer's Disease	PM _{2.5}	Economic value of hospitalizations as a result Alzheimer's disease based on Kioumourtzoglou et al. (2016)
Hospitalization, Parkinson's Disease	PM _{2.5}	Number of hospitalizations as a result Parkinson's disease based on Kioumourtzoglou et al. (2016)
\$ Hospitalization, Parkinson's Disease	PM _{2.5}	Economic value of hospitalizations as a result Parkinson's disease based on Kioumourtzoglou et al. (2016)
Hospitalization, All Respiratory	PM _{2.5}	Number of respiratory-related hospitalizations based on Ostro et al. (2009) and Bell et al. (2015)
\$ Hospitalization, All Respiratory	PM _{2.5}	Economic value of of respiratory-related hospitalizations based on Ostro et al. (2009) and Bell et al. (2015)
Incidence, Stroke	PM _{2.5}	Number of stroke incidences based on Kloog et al. (2012)
\$ Incidence, Stroke	PM _{2.5}	Economic value of stroke incidences based on Kloog et al. (2012)
Incidence, Out of Hospital Cardiac Arrest	PM _{2.5}	Number of out of hospital cardiac arrest incidences based on Silverman et al. (2010), Rosenthal et al. (2008), and Ensor et al. (2013)
\$ Incidence, Out of Hospital Cardiac Arrest	PM _{2.5}	Economic value of out of hospital cardiac arrest incidences based on Silverman et al. (2010), Rosenthal et al. (2008), and Ensor et al. (2013)
Incidence, Lung Cancer	PM _{2.5}	Number of out of lung cancer incidences based on Gharibvand et al. (2016)
\$ Incidence, Lung Cancer	PM _{2.5}	Economic value of lung cancer incidences based on Gharibvand et al. (2016)
Incidence, Asthma	PM _{2.5}	Number of asthma incidences based on Tetreault et al. (2016)
\$ Incidence, Asthma	PM _{2.5}	Economic value of asthma incidences based on Tetreault et al. (2016)
Minor Restricted Activity Days	PM _{2.5}	Number of minor restricted activity days (days on which activity is reduced, but not severely restricted – e.g., missing work or being confined to bed is too severe to be MRAD) based on Ostro and Rothschild (1989)
\$ Minor Restricted Activity Days	PM _{2.5}	Economic value of minor restricted activity days based on Ostro and Rothschild (1989)
Work Loss Days	PM _{2.5}	Number of work days lost due to illness based on Ostro (1987)

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Health Effect	Air Pollutant	Description
\$ Work Loss Days	PM _{2.5}	Economic value of work days lost due to illness based on Ostro (1987)
School Loss Days	O ₃	Number of school absences as a result of air pollution based on Adams et al. (1999)
\$ School Loss Days	O ₃	Economic value of school absences as a result of air pollution based on Adams et al. (1999)
Asthma Symptoms, Cough	O ₃	Number of cough episodes as a result of air pollution based on Lewis et al. (2013)
\$ Asthma Symptoms, Cough	O ₃	Economic value of cough episodes as a result of air pollution based on Lewis et al. (2013)
Asthma Symptoms, Wheeze	O ₃	Number of wheeze episodes as a result of air pollution based on Lewis et al. (2013)
\$ Asthma Symptoms, Wheeze	O ₃	Economic value of wheeze episodes as a result of air pollution based on Lewis et al. (2013)
Asthma Symptoms, Chest Tightness	O ₃	Number of chest tightness episodes as a result of air pollution based on Lewis et al. (2013)
\$ Asthma Symptoms, Chest Tightness	O ₃	Economic value of chest tightness episodes as a result of air pollution based on Lewis et al. (2013)
Asthma Symptoms, Shortness of Breath	O ₃	Number of shortness of breath episodes as a result of air pollution based on Lewis et al. (2013)
\$ Asthma Symptoms, Shortness of Breath	O ₃	Economic value of shortness of breath episodes as a result of air pollution based on Lewis et al. (2013)
Emergency Room Visits, Asthma	O ₃	Number of asthma-related emergency room visits Mar and Koenig (2009)
\$ Emergency Room Visits, Asthma	O ₃	Economic value of asthma-related emergency room visits Mar and Koenig (2009)

Notes: * For adult mortality and nonfatal heart attacks, COBRA contains multiple health impact functions that relate PM_{2.5} and each health effect. Therefore, there are high and low estimates of the cases avoided and their economic values for each of these health effects. More details on the underlying health impact functions are available in Appendix C. In addition, future costs are calculated using a discount rate that you selected before running the scenario.

Table 1. Quantified Benefits, 2035, Current Policy Scenario. Quantified health benefits for all counties in New Jersey based on this scenario of GHG Reduction Measures. Unless otherwise noted, the units in this table are “change in incidence” (cases, annual) with positive values indicating health improvements. Using "ER Visits, Asthma" for Hudson County as an example, in 2035 there will be 2.42 fewer asthma induced emergency room visits due to the improved air quality from all of New Jersey's GHG Reduction Measures. Cells shaded in yellow indicate the counties with the top three highest values for a given health outcome. See [Section 2.B](#) for definitions of health benefits below.

County	Acute Bronchitis	AMI, Nonfatal (high)	AMI, Nonfatal (low)	Asthma Exacerb., Cough	Asthma Exacerb., Shortness of Breath	Asthma Exacerb., Wheeze	Emergency Room Visits, Asthma	HA, All Cardiovasc.	HA, All Respiratory	HA, Asthma	HA, Chronic Lung Disease	Lower Respiratory Symptoms	Minor Restricted Activity Days	Mortality, All Cause (low)	Mortality, All Cause (high)	Infant Mortality	Upper Respiratory Symptoms	Work Loss Days
Atlantic	0.41	0.31	0.03	1.74	2.35	3.58	0.23	0.08	0.05	0.01	0.02	5.23	220.99	0.34	0.78	0.00	7.46	37.19
Bergen	3.76	3.08	0.33	16.10	21.68	33.12	2.27	0.77	0.50	0.07	0.18	47.79	2,267.34	2.82	6.38	0.01	68.10	381.41
Burlington	0.88	0.76	0.08	3.79	5.11	7.80	0.63	0.27	0.13	0.02	0.07	11.22	521.33	0.82	1.85	0.00	15.97	87.52
Camden	1.53	0.84	0.09	6.41	8.63	13.18	0.48	0.22	0.14	0.02	0.03	19.52	779.19	1.18	2.68	0.01	27.80	131.91
Cape May	0.06	0.09	0.01	0.26	0.35	0.54	0.04	0.02	0.02	0.00	0.00	0.81	36.49	0.10	0.22	0.00	1.15	6.09
Cumberland	0.16	0.12	0.01	0.66	0.88	1.35	0.13	0.03	0.02	0.01	0.01	1.99	79.56	0.12	0.27	0.00	2.83	13.52
Essex	4.37	2.68	0.29	18.52	24.94	38.11	1.80	0.61	0.28	0.08	0.11	55.67	2,266.76	2.47	5.61	0.02	79.45	382.51
Gloucester	0.91	1.39	0.15	3.94	5.30	8.10	0.87	0.29	0.18	0.04	0.09	11.53	519.46	0.82	1.87	0.00	16.42	86.99
Hudson	2.62	1.55	0.17	10.64	14.32	21.88	2.42	0.47	0.19	0.08	0.15	33.34	1,561.58	1.25	2.82	0.01	47.37	270.09
Hunterdon	0.17	0.26	0.03	0.78	1.05	1.61	0.09	0.06	0.04	0.00	0.01	2.21	127.10	0.18	0.41	0.00	3.15	20.85
Mercer	1.09	1.01	0.11	4.73	6.37	9.74	0.62	0.23	0.14	0.03	0.06	13.83	618.71	0.76	1.72	0.00	19.69	104.47
Middlesex	4.18	3.27	0.35	18.15	24.44	37.35	0.80	0.50	0.39	0.04	0.07	53.17	2,483.82	2.83	6.40	0.01	75.81	422.33
Monmouth	1.85	1.94	0.21	7.95	10.70	16.35	1.34	0.48	0.30	0.04	0.12	23.50	1,072.50	1.67	3.77	0.00	33.52	178.66
Morris	1.13	1.13	0.12	4.83	6.51	9.94	0.43	0.27	0.16	0.02	0.04	14.38	670.60	0.91	2.05	0.00	20.51	112.08
Ocean	1.39	1.46	0.16	5.73	7.72	11.80	0.58	0.35	0.23	0.03	0.04	17.63	600.72	1.40	3.15	0.00	25.07	101.04
Passaic	1.35	0.72	0.08	5.77	7.77	11.87	0.27	0.17	0.10	0.01	0.02	17.16	683.49	0.78	1.77	0.00	24.47	115.74
Salem	0.07	0.09	0.01	0.30	0.40	0.61	0.03	0.02	0.01	0.00	0.00	0.90	37.19	0.07	0.16	0.00	1.28	6.23
Somerset	1.00	0.82	0.09	4.27	5.75	8.79	0.79	0.26	0.14	0.03	0.06	12.72	596.84	0.72	1.62	0.00	18.12	100.20
Sussex	0.14	0.14	0.01	0.61	0.82	1.25	0.09	0.03	0.02	0.00	0.01	1.77	90.10	0.14	0.32	0.00	2.52	14.92
Union	3.44	1.85	0.20	14.65	19.73	30.14	0.68	0.45	0.25	0.03	0.07	43.82	1,825.67	2.06	4.66	0.01	62.47	307.94
Warren	0.12	0.14	0.02	0.51	0.69	1.05	0.04	0.03	0.02	0.00	0.00	1.47	77.20	0.13	0.29	0.00	2.10	12.84
County Average	1.46	1.13	0.12	6.21	8.36	12.77	0.70	0.27	0.16	0.03	0.06	18.56	816.03	1.03	2.32	0.00	26.44	137.83
State Total	30.62	23.65	2.55	130.34	175.52	268.18	14.63	5.63	3.34	0.58	1.18	389.66	17,136.64	21.56	48.78	0.09	555.23	2,894.52

Table 2. Quantified Benefits, 2035, CCAP Scenario. Quantified health benefits for all counties in New Jersey based on this scenario of GHG Reduction Measures. Unless otherwise noted, the units in this table are “change in incidence” (cases, annual) with positive values indicating health improvements. Using "ER Visits, Asthma" for Hudson County as an example, in 2035 there will be 1.57 fewer asthma induced emergency room visits due to the improved air quality from all of New Jersey's GHG Reduction Measures. Cells shaded in yellow indicate the counties with the top three highest values for a given health outcome. See [Section 2.B](#) for definitions of health benefits below.

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County	Acute Bronchitis	AMI, Nonfatal (high)	AMI, Nonfatal (low)	Asthma Exacerb., Cough	Asthma Exacerb., Shortness of Breath	Asthma Exacerb., Wheeze	Emergency Room Visits, Asthma	HA, All Cardiovasc.	HA, All Respiratory	HA, Asthma	HA, Chronic Lung Disease	Lower Respiratory Symptoms	Minor Restricted Activity Days	Mortality, All Cause (low)	Mortality, All Cause (high)	Infant Mortality	Upper Respiratory Symptoms	Work Loss Days
Atlantic	0.23	0.17	0.02	0.97	1.30	1.99	0.13	0.04	0.03	0.00	0.01	2.90	122.52	0.19	0.43	0.00	4.13	20.62
Bergen	2.41	1.98	0.21	10.34	13.92	21.27	1.46	0.50	0.32	0.04	0.11	30.70	1,456.09	1.81	4.10	0.01	43.73	244.93
Burlington	0.48	0.41	0.04	2.07	2.79	4.26	0.35	0.15	0.07	0.01	0.04	6.13	284.86	0.45	1.01	0.00	8.72	47.82
Camden	0.84	0.46	0.05	3.53	4.75	7.25	0.26	0.12	0.08	0.01	0.02	10.75	428.91	0.65	1.47	0.00	15.30	72.61
Cape May	0.04	0.05	0.01	0.15	0.21	0.32	0.02	0.01	0.01	0.00	0.00	0.48	21.53	0.06	0.13	0.00	0.68	3.59
Cumberland	0.10	0.07	0.01	0.40	0.54	0.82	0.08	0.02	0.01	0.00	0.01	1.21	48.48	0.07	0.16	0.00	1.72	8.24
Essex	2.79	1.71	0.18	11.82	15.92	24.33	1.15	0.39	0.18	0.05	0.07	35.54	1,446.87	1.58	3.58	0.01	50.71	244.15
Gloucester	0.38	0.58	0.06	1.64	2.21	3.38	0.36	0.12	0.08	0.02	0.04	4.80	216.40	0.34	0.78	0.00	6.84	36.24
Hudson	1.70	1.01	0.11	6.91	9.30	14.21	1.57	0.31	0.12	0.05	0.10	21.65	1,013.98	0.81	1.83	0.00	30.76	175.37
Hunterdon	0.09	0.14	0.01	0.42	0.57	0.87	0.05	0.03	0.02	0.00	0.01	1.19	68.62	0.10	0.22	0.00	1.70	11.25
Mercer	0.64	0.60	0.06	2.80	3.77	5.76	0.37	0.14	0.09	0.02	0.03	8.18	365.81	0.45	1.02	0.00	11.64	61.76
Middlesex	2.17	1.70	0.18	9.44	12.71	19.42	0.42	0.26	0.20	0.02	0.04	27.66	1,291.77	1.47	3.33	0.00	39.42	219.63
Monmouth	1.05	1.11	0.12	4.53	6.10	9.32	0.76	0.27	0.17	0.02	0.07	13.40	611.51	0.95	2.15	0.00	19.11	101.87
Morris	0.70	0.70	0.08	2.99	4.03	6.15	0.27	0.17	0.10	0.01	0.02	8.90	414.74	0.56	1.27	0.00	12.68	69.32
Ocean	0.79	0.84	0.09	3.27	4.41	6.73	0.33	0.20	0.13	0.02	0.02	10.06	342.84	0.80	1.80	0.00	14.31	57.67
Passaic	0.98	0.52	0.06	4.18	5.63	8.60	0.20	0.12	0.07	0.01	0.02	12.43	495.01	0.57	1.28	0.00	17.72	83.82
Salem	0.04	0.05	0.00	0.16	0.21	0.32	0.02	0.01	0.01	0.00	0.00	0.47	19.45	0.04	0.09	0.00	0.67	3.26
Somerset	0.57	0.46	0.05	2.42	3.26	4.98	0.45	0.15	0.08	0.02	0.03	7.21	338.11	0.41	0.92	0.00	10.26	56.76
Sussex	0.09	0.08	0.01	0.38	0.51	0.78	0.06	0.02	0.02	0.00	0.01	1.10	55.92	0.09	0.20	0.00	1.56	9.26
Union	1.86	1.00	0.11	7.89	10.62	16.23	0.37	0.24	0.13	0.02	0.04	23.61	983.34	1.11	2.51	0.01	33.64	165.85
Warren	0.06	0.08	0.01	0.28	0.38	0.59	0.02	0.02	0.01	0.00	0.00	0.82	42.90	0.07	0.16	0.00	1.17	7.14
County Average	0.86	0.65	0.07	3.65	4.91	7.50	0.41	0.16	0.09	0.02	0.03	10.91	479.51	0.60	1.35	0.00	15.55	81.01
State Total	18.01	13.72	1.48	76.58	103.13	157.56	8.68	3.29	1.94	0.34	0.69	229.18	10,069.66	12.56	28.43	0.05	326.48	1,701.15

Table 3. Quantified Benefits, 2050, Current Policy Scenario. Quantified health benefits for all counties in New Jersey based on this scenario of GHG Reduction Measures. Unless otherwise noted, the units in this table are “change in incidence” (cases, annual) with positive values indicating health improvements. Using "ER Visits, Asthma" for Hudson County as an example, in 2050 there will be 6.22 fewer asthma induced emergency room visits due to the improved air quality from all of New Jersey's GHG Reduction Measures. Cells shaded in yellow indicate the counties with the top three highest values for a given health outcome. See [Section 2.B](#) for definitions of health benefits below.

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County	Acute Bronchitis	AMI, Nonfatal (high)	AMI, Nonfatal (low)	Asthma Exacerb., Cough	Asthma Exacerb., Shortness of Breath	Asthma Exacerb., Wheeze	Emergency Room Visits, Asthma	HA, All Cardiovasc.	HA, All Respiratory	HA, Asthma	HA, Chronic Lung Disease	Lower Respiratory Symptoms	Minor Restricted Activity Days	Mortality, All Cause (low)	Mortality, All Cause (high)	Infant Mortality	Upper Respiratory Symptoms	Work Loss Days
Atlantic	1.01	0.76	0.08	4.30	5.79	8.84	0.57	0.19	0.13	0.02	0.04	12.90	545.28	0.85	1.92	0.00	18.40	91.78
Bergen	9.77	8.02	0.86	41.91	56.44	86.24	5.90	2.01	1.31	0.18	0.46	124.33	5,902.26	7.35	16.60	0.02	177.34	993.02
Burlington	2.19	1.87	0.20	9.40	12.66	19.35	1.57	0.67	0.33	0.06	0.16	27.82	1,292.66	2.03	4.58	0.01	39.59	217.03
Camden	3.74	2.06	0.22	15.63	21.04	32.15	1.17	0.54	0.35	0.05	0.07	47.60	1,900.43	2.88	6.52	0.02	67.81	321.76
Cape May	0.16	0.22	0.02	0.66	0.88	1.35	0.09	0.05	0.04	0.00	0.01	2.02	91.29	0.24	0.54	0.00	2.88	15.23
Cumberland	0.39	0.31	0.03	1.65	2.22	3.39	0.33	0.08	0.05	0.02	0.02	4.98	199.68	0.29	0.67	0.00	7.10	33.94
Essex	11.39	6.98	0.75	48.33	65.08	99.45	4.70	1.60	0.73	0.22	0.30	145.08	5,912.19	6.45	14.63	0.04	207.31	997.85
Gloucester	2.07	3.18	0.34	8.99	12.10	18.49	1.98	0.67	0.42	0.10	0.21	26.28	1,184.79	1.88	4.26	0.01	37.46	198.42
Hudson	6.73	3.98	0.43	27.32	36.79	56.21	6.22	1.22	0.49	0.20	0.39	85.57	4,009.67	3.20	7.24	0.02	121.67	693.60
Hunterdon	0.44	0.65	0.07	1.97	2.65	4.05	0.22	0.14	0.11	0.01	0.03	5.56	320.11	0.46	1.04	0.00	7.93	52.51
Mercer	2.75	2.57	0.28	12.00	16.15	24.68	1.58	0.58	0.37	0.06	0.15	35.02	1,567.64	1.92	4.36	0.01	49.89	264.71
Middlesex	11.19	8.77	0.95	48.72	65.60	100.24	2.15	1.34	1.06	0.11	0.20	142.55	6,664.33	7.59	17.17	0.03	203.49	1,133.37
Monmouth	4.79	5.03	0.54	20.64	27.80	42.48	3.48	1.25	0.79	0.11	0.31	61.00	2,785.56	4.33	9.78	0.01	87.07	464.08
Morris	2.87	2.87	0.31	12.29	16.54	25.28	1.09	0.69	0.41	0.05	0.10	36.54	1,704.35	2.30	5.21	0.00	52.13	284.88
Ocean	3.52	3.72	0.40	14.56	19.61	29.96	1.48	0.88	0.59	0.07	0.10	44.75	1,525.13	3.54	8.00	0.01	63.66	256.55
Passaic	3.39	1.81	0.20	14.52	19.55	29.88	0.68	0.42	0.25	0.03	0.05	43.18	1,719.85	1.97	4.45	0.01	61.58	291.25
Salem	0.18	0.22	0.02	0.74	1.00	1.52	0.08	0.04	0.03	0.00	0.01	2.24	92.29	0.18	0.41	0.00	3.18	15.45
Somerset	2.53	2.07	0.22	10.81	14.56	22.24	1.99	0.66	0.35	0.08	0.16	32.18	1,510.54	1.81	4.10	0.01	45.86	253.62
Sussex	0.36	0.35	0.04	1.56	2.10	3.21	0.23	0.09	0.06	0.00	0.03	4.54	231.29	0.36	0.82	0.00	6.47	38.29
Union	9.15	4.92	0.53	38.99	52.51	80.23	1.81	1.19	0.66	0.09	0.19	116.50	4,857.64	5.48	12.39	0.02	166.30	819.52
Warren	0.29	0.36	0.04	1.30	1.75	2.67	0.10	0.09	0.05	0.00	0.01	3.73	195.17	0.32	0.72	0.00	5.31	32.47
County Average	3.76	2.89	0.31	16.01	21.56	32.95	1.78	0.69	0.41	0.07	0.14	47.83	2,105.34	2.64	5.97	0.01	68.21	355.68
State Total	78.90	60.69	6.54	336.27	452.82	691.90	37.43	14.42	8.57	1.48	3.00	1,004.37	44,212.16	55.44	125.41	0.23	1,432.42	7,469.33

Table 4. Quantified Benefits, 2050, CCAP Scenario. Quantified health benefits for all counties in New Jersey based on this scenario of GHG Reduction Measures. Unless otherwise noted, the units in this table are “change in incidence” (cases, annual) with positive values indicating health improvements. Using "ER Visits, Asthma" for Hudson County as an example, in 2050 there will be 5.10 fewer asthma induced emergency room visits due to the improved air quality from all of New Jersey's GHG Reduction Measures. Cells shaded in yellow indicate the counties with the top three highest values for a given health outcome. See [Section 2.B](#) for definitions of health benefits below.

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County	Acute Bronchitis	AMI, Nonfatal (high)	AMI, Nonfatal (low)	Asthma Exacerb., Cough	Asthma Exacerb., Shortness of Breath	Asthma Exacerb., Wheeze	Emergency Room Visits, Asthma	HA, All Cardiovasc.	HA, All Respiratory	HA, Asthma	HA, Chronic Lung Disease	Lower Respiratory Symptoms	Minor Restricted Activity Days	Mortality, All Cause (low)	Mortality, All Cause (high)	Infant Mortality	Upper Respiratory Symptoms	Work Loss Days
Atlantic	0.77	0.57	0.06	3.26	4.39	6.70	0.43	0.14	0.09	0.01	0.03	9.78	413.34	0.64	1.46	0.00	13.95	69.57
Bergen	8.31	6.82	0.74	35.64	48.00	73.34	5.02	1.71	1.12	0.15	0.39	105.75	5,019.54	6.25	14.12	0.02	150.81	844.48
Burlington	1.62	1.39	0.15	6.97	9.38	14.34	1.17	0.50	0.24	0.04	0.12	20.62	957.83	1.50	3.40	0.01	29.33	160.81
Camden	2.76	1.52	0.16	11.54	15.53	23.73	0.86	0.40	0.26	0.04	0.05	35.15	1,403.10	2.13	4.82	0.01	50.06	237.55
Cape May	0.13	0.17	0.02	0.53	0.72	1.09	0.07	0.04	0.03	0.00	0.01	1.64	73.83	0.19	0.44	0.00	2.33	12.32
Cumberland	0.32	0.25	0.03	1.34	1.80	2.75	0.27	0.06	0.04	0.01	0.02	4.04	161.85	0.24	0.54	0.00	5.75	27.51
Essex	9.61	5.89	0.63	40.79	54.92	83.92	3.97	1.35	0.61	0.18	0.25	122.47	4,989.91	5.44	12.35	0.04	174.95	842.15
Gloucester	1.45	2.23	0.24	6.31	8.49	12.98	1.39	0.47	0.30	0.07	0.15	18.45	831.63	1.32	2.99	0.00	26.29	139.27
Hudson	5.52	3.26	0.35	22.40	30.16	46.08	5.10	1.00	0.40	0.17	0.32	70.17	3,287.66	2.63	5.93	0.02	99.75	568.68
Hunterdon	0.32	0.47	0.05	1.43	1.92	2.94	0.16	0.10	0.08	0.00	0.02	4.04	232.50	0.33	0.76	0.00	5.76	38.14
Mercer	2.15	2.00	0.22	9.35	12.59	19.24	1.23	0.46	0.29	0.05	0.12	27.31	1,222.02	1.50	3.40	0.01	38.89	206.34
Middlesex	8.77	6.88	0.74	38.16	51.39	78.52	1.68	1.05	0.83	0.09	0.15	111.70	5,220.74	5.95	13.45	0.02	159.39	887.81
Monmouth	3.74	3.92	0.42	16.10	21.69	33.14	2.72	0.98	0.62	0.09	0.24	47.60	2,173.10	3.37	7.63	0.01	67.92	362.03
Morris	2.28	2.28	0.25	9.76	13.15	20.09	0.87	0.55	0.32	0.04	0.08	29.04	1,354.56	1.83	4.14	0.00	41.43	226.41
Ocean	2.69	2.85	0.31	11.15	15.01	22.93	1.13	0.68	0.45	0.06	0.07	34.26	1,167.50	2.71	6.13	0.01	48.73	196.39
Passaic	2.98	1.59	0.17	12.75	17.16	26.22	0.60	0.37	0.22	0.02	0.05	37.90	1,509.71	1.73	3.91	0.01	54.05	255.66
Salem	0.14	0.17	0.02	0.57	0.77	1.17	0.06	0.03	0.02	0.00	0.01	1.72	71.08	0.14	0.31	0.00	2.45	11.90
Somerset	1.91	1.56	0.17	8.16	10.98	16.78	1.50	0.50	0.26	0.06	0.12	24.29	1,140.03	1.37	3.09	0.01	34.61	191.40
Sussex	0.28	0.28	0.03	1.23	1.65	2.53	0.18	0.07	0.05	0.00	0.03	3.57	181.96	0.29	0.65	0.00	5.09	30.12
Union	7.12	3.83	0.41	30.34	40.85	62.42	1.41	0.93	0.52	0.07	0.15	90.68	3,779.86	4.26	9.64	0.02	129.38	637.64
Warren	0.21	0.26	0.03	0.94	1.26	1.93	0.08	0.06	0.04	0.00	0.01	2.70	141.33	0.23	0.52	0.00	3.84	23.51
County Average	3.00	2.29	0.25	12.79	17.23	26.33	1.42	0.55	0.32	0.06	0.11	38.23	1,682.53	2.10	4.75	0.01	54.51	284.27
State Total	63.08	48.19	5.19	268.69	361.82	552.85	29.89	11.45	6.79	1.18	2.38	802.88	35,333.08	44.05	99.67	0.18	1,144.76	5,969.68

Table 5. Monetized Benefits, 2035, Current Policy Scenario. Monetized annual health benefits for all counties in New Jersey based on this scenario of GHG Reduction Measures. All values are in 2024 dollars. For example, Bergen County is estimated to save \$198,766.14 in 2035 under the CP CCAP scenario for avoided minor restricted activity days.

COMPREHENSIVE CLIMATE ACTION PLAN: APPENDICES

County	\$ Acute Bronchitis	\$ AMI, Nonfatal (high)	\$ AMI, Nonfatal (low)	\$ Asthma Exacerb.	\$ Emergency Room Visits, Asthma	\$ Hosp. Admit., All Cardiovasc.	\$ Hosp. Admit., All Respiratory	\$ Lower Respiratory Symptoms	\$ Minor Restricted Activity Days	\$ Mortality, All Cause (low)	\$ Mortality, All Cause (high)	\$ Infant Mortality	\$ Upper Respiratory Symptoms	\$ Work Loss Days
Atlantic	253.46	49,913.32	5,372.94	569.33	130.37	3,910.13	2,723.04	141.21	19,372.98	3,756,937.14	8,514,524.64	23,978.88	318.52	7,445.57
Bergen	2,317.42	500,669.66	53,920.73	5,260.52	1,276.93	39,496.77	27,115.33	1,290.62	198,766.14	30,895,972.92	69,800,500.08	100,851.34	2,909.60	76,353.14
Burlington	544.67	123,507.73	13,296.36	1,239.48	357.42	13,864.20	7,775.23	303.06	45,702.58	8,943,923.91	20,226,805.90	36,233.76	682.10	17,520.70
Camden	947.04	135,371.97	14,575.39	2,093.37	269.35	11,368.24	7,108.16	527.22	68,307.51	12,917,123.79	29,274,843.72	86,961.35	1,187.69	26,407.02
Cape May	39.21	13,309.37	1,432.54	85.83	19.84	1,091.67	793.98	21.83	3,198.49	1,053,173.34	2,379,354.78	2,068.11	49.19	1,218.65
Cumberland	96.31	19,582.51	2,107.78	214.76	73.84	1,560.11	1,133.87	53.62	6,975.02	1,281,849.67	2,900,681.59	6,480.08	120.78	2,706.82
Essex	2,696.70	445,079.26	47,939.41	6,053.98	1,014.85	31,666.49	16,258.95	1,503.26	198,714.97	27,051,019.47	61,413,910.78	209,302.64	3,394.45	76,574.11
Gloucester	559.01	223,779.03	24,095.25	1,287.36	489.38	15,003.12	11,046.42	311.27	45,538.02	9,023,123.21	20,454,905.05	32,283.74	701.49	17,413.69
Hudson	1,619.78	250,104.49	26,933.20	3,476.22	1,363.89	24,526.94	13,512.91	900.47	136,895.73	13,648,141.69	30,852,770.13	90,752.71	2,023.86	54,068.40
Hunterdon	106.97	41,052.99	4,419.37	255.17	48.49	2,889.21	2,155.92	59.60	11,142.19	1,998,474.26	4,522,981.98	3,271.50	134.46	4,173.36
Mercer	670.92	159,400.28	17,162.91	1,546.99	351.02	11,805.08	8,089.13	373.44	54,239.29	8,309,219.58	18,816,876.15	56,930.36	841.03	20,912.77
Middlesex	2,577.41	526,216.52	56,678.27	5,932.09	451.05	25,502.92	19,221.37	1,435.89	217,743.47	30,959,420.65	70,055,555.44	114,179.61	3,239.01	84,545.56
Monmouth	1,138.69	314,550.17	33,868.82	2,597.26	755.88	24,691.74	16,684.94	634.57	94,020.87	18,225,841.80	41,216,995.58	51,229.93	1,432.02	35,766.11
Morris	697.05	179,999.25	19,379.09	1,579.65	242.67	13,885.22	8,151.23	388.38	58,788.36	9,921,112.08	22,414,503.64	23,013.05	876.15	22,437.09
Ocean	855.86	219,885.86	23,672.03	1,874.22	328.26	17,657.77	11,362.37	476.11	52,661.64	15,275,448.98	34,492,325.30	31,742.12	1,071.15	20,227.67
Passaic	832.12	114,563.03	12,334.14	1,885.64	152.78	8,525.59	4,978.83	463.54	59,917.74	8,551,001.23	19,367,217.79	42,306.24	1,045.30	23,168.73
Salem	43.72	13,602.18	1,464.14	97.32	18.06	908.52	588.78	24.33	3,260.58	796,313.76	1,799,622.64	1,495.70	54.77	1,246.49
Somerset	617.03	134,609.94	14,493.96	1,395.50	442.99	13,393.09	8,032.59	343.53	52,322.32	7,837,825.66	17,720,830.11	32,480.30	774.01	20,058.46
Sussex	85.77	23,038.33	2,479.82	198.66	50.89	1,789.80	1,402.03	47.78	7,899.04	1,553,085.15	3,513,129.31	4,268.56	107.73	2,985.88
Union	2,124.57	293,567.21	31,624.44	4,787.52	383.75	22,872.74	13,005.83	1,183.44	160,046.88	22,517,561.85	50,960,520.37	114,488.08	2,669.04	61,645.21
Warren	71.54	22,730.12	2,446.72	167.52	23.13	1,741.33	992.91	39.82	6,767.63	1,381,522.10	3,119,700.79	3,901.61	89.66	2,570.99
County Average	899.77	181,168.25	19,509.40	2,028.50	392.61	13,721.46	8,673.04	501.10	71,537.21	11,233,242.49	25,419,931.23	50,867.60	1,129.62	27,592.69
State Total	18,895.27	3,804,533.24	409,697.31	42,598.41	8,244.85	288,150.68	182,133.82	10,523.01	1,502,281.45	235,898,092.22	533,818,555.78	1,068,219.66	23,722.02	579,446.41

Table 6. Monetized Benefits, 2035, CCAP Scenario . Monetized annual health benefits for all counties in New Jersey based on this scenario of GHG Reduction Measures. All values are in 2024 dollars. For example, Bergen County is estimated to save \$127,647.83 in 2035 under the CCAP scenario for avoided minor restricted activity days.

COMPREHENSIVE CLIMATE ACTION PLAN: APPENDICES

County	\$ Acute Bronchitis	\$ AMI, Nonfatal (high)	\$ AMI, Nonfatal (low)	\$ Asthma Exacerb.	\$ Emergency Room Visits, Asthma	\$ Hosp. Admit., All Cardiovasc.	\$ Hosp. Admit., All Respiratory	\$ Lower Respiratory Symptoms	\$ Minor Restricted Activity Days	\$ Mortality, All Cause (low)	\$ Mortality, All Cause (high)	\$ Infant Mortality	\$ Upper Respiratory Symptoms	\$ Work Loss Days
Atlantic	140.54	27,675.45	2,978.82	315.64	72.28	2,167.81	1,509.67	78.30	10,740.84	2,082,919.08	4,720,789.89	13,294.23	176.59	4,127.94
Bergen	1,488.57	321,595.92	34,626.07	3,378.08	820.02	25,363.01	17,412.33	828.96	127,647.83	19,841,045.36	44,829,059.28	64,764.07	1,868.41	49,032.39
Burlington	297.65	67,493.65	7,264.99	677.24	195.29	7,575.17	4,248.27	165.61	24,972.21	4,886,967.58	11,052,524.96	19,797.88	372.69	9,573.24
Camden	521.40	74,528.50	8,022.77	1,152.24	148.26	6,257.35	3,912.52	290.25	37,600.30	7,110,202.00	16,115,416.32	47,866.77	653.73	14,535.51
Cape May	23.14	7,853.45	845.25	50.64	11.71	644.12	468.48	12.88	1,887.25	621,417.30	1,403,946.10	1,220.27	29.02	719.05
Cumberland	58.69	11,932.76	1,284.32	130.86	44.99	950.61	690.89	32.67	4,250.09	781,066.92	1,767,501.03	3,948.48	73.59	1,649.33
Essex	1,721.74	284,162.26	30,597.82	3,863.95	647.76	20,211.02	10,377.30	959.69	126,839.95	17,266,300.74	39,203,741.20	133,591.34	2,166.49	48,875.36
Gloucester	232.94	93,245.52	10,037.23	536.26	203.87	6,249.64	4,601.49	129.69	18,970.70	3,758,864.19	8,521,979.92	13,448.44	292.21	7,254.10
Hudson	1,051.97	162,429.34	17,487.78	2,257.09	885.59	15,925.13	8,773.88	584.78	88,890.83	8,862,033.60	20,034,896.15	58,926.51	1,314.07	35,107.33
Hunterdon	57.75	22,164.96	2,385.76	137.75	26.17	1,559.70	1,163.85	32.18	6,015.18	1,078,878.04	2,441,843.91	1,766.10	72.59	2,252.97
Mercer	396.74	94,258.93	10,147.04	914.60	207.53	6,979.29	4,782.40	220.82	32,068.64	4,912,702.65	11,125,943.97	33,658.63	497.23	12,364.22
Middlesex	1,340.89	273,757.98	29,474.50	3,084.81	234.57	13,261.94	9,995.52	746.93	113,243.01	16,100,753.61	36,438,056.25	59,378.09	1,684.33	43,967.74
Monmouth	649.36	179,376.83	19,310.04	1,480.79	430.97	14,077.58	9,512.69	361.85	53,607.69	10,391,624.86	23,501,968.59	29,208.63	816.44	20,392.11
Morris	431.15	111,335.14	11,984.79	976.91	150.08	8,587.08	5,041.00	240.22	36,358.18	6,135,730.97	13,862,999.31	14,232.27	541.84	13,876.14
Ocean	488.52	125,507.88	13,509.76	1,069.62	187.34	10,077.28	6,484.52	271.75	30,055.19	8,717,952.83	19,686,302.23	18,115.52	611.30	11,544.17
Passaic	602.71	82,978.79	8,932.73	1,365.62	110.65	6,174.42	3,605.78	335.73	43,395.09	6,192,964.58	14,027,011.79	30,639.51	757.03	16,779.58
Salem	22.87	7,114.68	765.76	50.90	9.45	475.16	307.94	12.73	1,705.34	416,484.34	941,258.35	782.27	28.64	651.93
Somerset	349.60	76,268.43	8,210.33	790.49	250.95	7,586.60	4,550.14	194.63	29,640.14	4,439,987.67	10,039,282.06	18,399.15	438.44	11,362.62
Sussex	53.23	14,297.60	1,538.87	123.28	31.58	1,110.67	870.04	29.65	4,901.89	963,789.02	2,180,172.60	2,648.90	66.85	1,852.93
Union	1,144.77	158,177.70	17,031.98	2,578.36	206.69	12,318.17	7,004.39	637.58	86,204.66	12,128,029.67	27,451,740.88	61,661.11	1,437.41	33,201.44
Warren	39.76	12,632.30	1,359.65	93.09	12.86	967.65	551.76	22.13	3,760.85	767,722.05	1,733,695.65	2,168.13	49.83	1,428.71
County Average	529.24	105,180.38	11,323.63	1,191.82	232.79	8,024.73	5,041.18	294.72	42,035.99	6,545,592.24	14,813,339.54	29,976.97	664.23	16,216.61
State Total	11,113.98	2,208,788.06	237,796.26	25,028.24	4,888.59	168,519.40	105,864.85	6,189.03	882,755.86	137,457,437.04	311,080,130.43	629,516.28	13,948.73	340,548.84

Table 7. Monetized Benefits, 2050, Current Policy Scenario. Monetized annual health benefits for all counties in New Jersey based on this scenario of GHG Reduction Measures. All values are in 2024 dollars. For example, Bergen County is estimated to save \$517,420.91 in 2050 under the CP scenario for avoided minor restricted activity days.

COMPREHENSIVE CLIMATE ACTION PLAN: APPENDICES

County	\$ Acute Bronchitis	\$ AMI, Nonfatal (high)	\$ AMI, Nonfatal (low)	\$ Asthma Exacerb.	\$ Emergency Room Visits, Asthma	\$ Hosp. Admit., All Cardiovasc.	\$ Hosp. Admit., All Respiratory	\$ Lower Respiratory Symptoms	\$ Minor Restricted Activity Days	\$ Mortality, All Cause (low)	\$ Mortality, All Cause (high)	\$ Infant Mortality	\$ Upper Respiratory Symptoms	\$ Work Loss Days
Atlantic	625.21	123,124.97	13,258.45	1,404.93	321.70	9,649.03	6,719.58	348.37	47,801.95	9,270,312.83	21,007,232.54	59,170.24	786.01	18,372.45
Bergen	6,026.84	1,302,139.43	140,398.70	13,698.17	3,324.53	102,850.29	70,606.93	3,357.59	517,420.91	80,434,229.97	181,645,810.06	262,582.82	7,576.76	198,790.19
Burlington	1,349.97	306,119.87	32,972.13	3,073.74	886.28	34,381.50	19,281.38	751.25	113,320.68	22,177,509.58	50,146,137.98	89,849.96	1,691.52	43,445.89
Camden	2,308.56	329,998.67	35,554.20	5,106.60	657.01	27,732.25	17,339.74	1,285.43	166,601.36	31,506,297.50	71,388,365.71	212,121.32	2,897.34	64,412.11
Cape May	98.10	33,296.56	3,584.52	214.77	49.65	2,731.63	1,986.73	54.62	8,002.98	2,635,196.74	5,953,111.30	5,174.81	123.08	3,049.27
Cumberland	241.67	49,137.51	5,290.11	539.02	185.32	3,915.64	2,845.81	134.55	17,505.14	3,217,097.26	7,279,380.56	16,263.59	303.13	6,793.47
Essex	7,025.71	1,159,631.86	125,071.76	15,795.68	2,647.41	82,624.56	42,421.48	3,917.96	518,291.25	70,561,951.54	160,122,781.39	546,028.51	8,856.99	199,757.33
Gloucester	1,274.34	510,145.92	54,964.60	2,936.75	1,116.29	34,225.78	25,199.17	709.72	103,864.57	20,581,209.17	46,646,214.65	73,641.58	1,600.28	39,721.06
Hudson	4,155.70	641,692.20	69,170.92	8,928.23	3,502.49	62,995.63	34,705.86	2,310.89	351,507.54	35,046,967.78	79,199,646.57	233,064.31	5,198.20	138,849.84
Hunterdon	269.32	103,360.34	11,131.51	642.74	122.12	7,277.57	5,430.47	150.08	28,062.46	5,033,469.53	11,390,170.08	8,240.09	338.69	10,511.51
Mercer	1,698.88	403,641.07	43,492.56	3,920.38	889.46	29,916.89	20,499.41	945.81	137,426.67	21,054,310.67	47,667,141.89	144,262.68	2,131.40	52,992.05
Middlesex	6,907.45	1,410,341.99	152,118.29	15,922.25	1,210.43	68,454.03	51,591.82	3,849.72	584,227.88	83,075,928.04	187,895,820.35	306,426.24	8,694.17	226,886.27
Monmouth	2,955.50	816,452.09	87,980.72	6,747.17	1,963.41	64,145.26	43,344.03	1,647.43	244,196.01	47,339,950.74	107,028,005.22	133,074.72	3,720.20	92,903.48
Morris	1,770.68	457,256.16	49,258.64	4,015.36	616.80	35,295.63	20,719.79	986.76	149,412.00	25,215,869.17	56,957,814.82	58,494.00	2,227.16	57,028.93
Ocean	2,171.99	558,035.29	60,106.38	4,759.02	833.45	44,837.04	28,851.29	1,208.43	133,700.43	38,783,671.92	87,559,164.56	80,595.51	2,719.90	51,358.66
Passaic	2,092.81	288,137.55	31,040.24	4,745.57	384.48	21,456.55	12,530.16	1,166.01	150,770.58	21,517,790.28	48,725,724.54	106,465.51	2,630.75	58,303.96
Salem	108.45	33,742.98	3,633.08	241.49	44.82	2,254.41	1,461.01	60.36	8,090.24	1,975,877.36	4,464,954.54	3,711.33	135.90	3,092.94
Somerset	1,560.62	340,474.38	36,688.33	3,532.54	1,121.27	33,903.61	20,333.49	869.07	132,421.15	19,837,678.61	44,839,914.16	82,214.00	1,959.37	50,770.59
Sussex	220.12	59,124.45	6,365.86	509.99	130.62	4,594.61	3,599.16	122.62	20,276.15	3,986,717.88	9,017,225.30	10,957.54	276.56	7,664.79
Union	5,645.32	780,111.09	84,173.52	12,743.85	1,021.28	60,886.69	34,619.92	3,146.05	425,844.75	59,920,862.95	135,534,150.37	304,706.12	7,105.06	164,057.76
Warren	180.82	57,450.03	6,186.01	423.56	58.49	4,402.67	2,510.40	100.65	17,109.37	3,492,730.82	7,886,294.20	9,864.24	226.70	6,500.03
County Average	2,318.48	464,924.50	50,116.22	5,233.42	1,004.16	35,168.16	22,218.93	1,291.59	184,564.48	28,888,839.54	65,350,240.99	130,805.20	2,914.25	71,202.98
State Total	48,688.07	9,763,414.42	1,052,440.52	109,901.80	21,087.30	738,531.29	466,597.62	27,123.38	3,875,854.07	606,665,630.35	1,372,355,060.80	2,746,909.13	61,199.18	1,495,262.61

Table 8. Monetized Benefits, 2050, CCAP Scenario. Monetized annual health benefits for all counties in New Jersey based on this scenario of GHG Reduction Measures. All values are in 2024 dollars. For example, Bergen County is estimated to save \$440,037.55 in 2050 under the CCAP scenario for avoided minor restricted activity days.

COMPREHENSIVE CLIMATE ACTION PLAN: APPENDICES

County	\$ Acute Bronchitis	\$ AMI, Nonfatal (high)	\$ AMI, Nonfatal (low)	\$ Asthma Exacerb.	\$ Emergency Room Visits, Asthma	\$ Hosp. Admit., All Cardiovasc.	\$ Hosp. Admit., All Respiratory	\$ Lower Respiratory Symptoms	\$ Minor Restricted Activity Days	\$ Mortality, All Cause (low)	\$ Mortality, All Cause (high)	\$ Infant Mortality	\$ Upper Respiratory Symptoms	\$ Work Loss Days
Atlantic	473.99	93,343.89	10,050.11	1,064.95	243.86	7,314.04	5,093.51	264.10	36,235.71	7,027,177.39	15,924,893.51	44,852.24	595.80	13,926.76
Bergen	5,126.69	1,107,641.63	119,394.18	11,648.66	2,827.23	87,461.46	60,042.85	2,855.88	440,037.55	68,403,381.55	154,491,243.44	223,301.63	6,443.08	169,053.65
Burlington	1,000.47	226,865.73	24,430.38	2,277.43	656.69	25,474.24	14,286.20	556.72	83,967.70	16,432,696.97	37,159,161.26	66,574.10	1,253.30	32,191.36
Camden	1,704.84	243,696.12	26,248.22	3,769.93	485.05	20,473.16	12,801.04	949.19	123,002.64	23,260,751.42	52,710,555.06	156,602.59	2,138.94	47,553.94
Cape May	79.34	26,929.91	2,898.94	173.69	40.15	2,209.17	1,606.75	44.18	6,472.42	2,131,208.23	4,814,662.91	4,185.09	99.54	2,466.08
Cumberland	195.89	39,829.17	4,287.69	436.88	150.21	3,173.65	2,306.55	109.06	14,188.28	2,607,512.12	5,900,201.99	13,181.84	245.69	5,506.20
Essex	5,931.41	978,997.06	105,553.54	13,330.42	2,234.33	69,728.75	35,800.79	3,307.39	437,440.11	59,553,085.44	135,156,695.04	460,824.35	7,474.58	168,588.46
Gloucester	894.73	358,176.09	38,577.88	2,061.17	783.51	24,021.38	17,686.20	498.26	72,904.40	14,445,953.53	32,744,788.93	51,687.44	1,123.16	27,879.67
Hudson	3,408.22	526,265.41	56,711.96	7,319.98	2,871.70	51,647.85	28,454.34	1,895.08	288,212.35	28,735,509.20	64,943,441.92	191,087.66	4,261.80	113,843.04
Hunterdon	195.64	75,084.46	8,084.75	466.81	88.70	5,285.58	3,944.07	109.02	20,382.41	3,655,872.66	8,273,374.13	5,984.78	245.98	7,634.56
Mercer	1,324.62	314,716.01	33,901.80	3,055.84	693.33	23,319.31	15,978.77	737.40	107,128.04	16,412,113.66	37,160,571.12	112,451.91	1,661.36	41,307.37
Middlesex	5,413.37	1,105,260.98	119,155.18	12,471.68	948.17	53,618.57	40,411.17	3,016.60	457,675.73	65,078,147.52	147,213,921.80	240,030.77	6,809.92	177,728.10
Monmouth	2,306.22	637,082.18	68,632.26	5,263.28	1,531.66	50,037.58	33,811.46	1,285.41	190,504.63	36,930,526.31	83,502,160.85	103,810.66	2,902.00	72,474.05
Morris	1,407.51	363,469.36	39,147.37	3,191.09	490.20	28,050.12	16,466.49	784.33	118,747.44	20,040,388.70	45,270,549.73	46,487.43	1,769.96	45,323.39
Ocean	1,662.95	427,246.68	46,010.00	3,642.88	637.99	34,321.19	22,084.75	925.16	102,348.74	29,688,771.22	67,030,774.35	61,694.49	2,081.98	39,314.43
Passaic	1,837.28	252,955.23	27,246.83	4,165.59	337.49	18,834.18	10,998.79	1,023.61	132,348.39	18,888,426.81	42,773,481.37	93,454.93	2,309.23	51,179.16
Salem	83.54	25,993.03	2,798.36	186.00	34.52	1,736.44	1,125.33	46.49	6,231.60	1,521,929.49	3,439,276.17	2,858.64	104.68	2,382.34
Somerset	1,178.13	257,024.29	27,687.42	2,665.84	846.21	25,585.30	15,344.76	656.01	99,940.25	14,971,448.24	33,844,194.89	62,044.94	1,478.63	38,315.75
Sussex	173.18	46,517.31	5,007.98	401.21	102.76	3,614.53	2,831.42	96.48	15,951.43	3,136,364.52	7,094,118.40	8,620.25	217.57	6,029.88
Union	4,394.88	607,300.34	65,489.60	9,914.81	794.63	47,369.73	26,934.59	2,448.79	331,360.70	46,623,948.77	105,478,927.87	237,076.95	5,527.68	127,647.78
Warren	130.96	41,607.01	4,479.45	306.71	42.35	3,188.05	1,817.83	72.89	12,389.70	2,529,223.19	5,711,058.09	7,142.99	164.16	4,706.89
County Average	1,853.52	369,333.42	39,799.71	4,181.66	801.94	27,926.87	17,610.84	1,032.48	147,498.58	22,955,925.57	51,935,145.37	104,474.08	2,329.00	56,907.28
State Total	38,923.87	7,756,001.88	835,793.89	87,814.86	16,840.75	586,464.28	369,827.66	21,682.04	3,097,470.23	482,074,436.93	1,090,638,052.83	2,193,955.71	48,909.02	1,195,052.86

Table 9. Monetized Benefits, 2035, When Considering the Total Benefits of the CCAP Scenario's GHG reduction measures. Monetized annual health benefits for all counties in New Jersey based on this scenario of GHG Reduction Measures. All values are in 2024 dollars. For example, Bergen County is estimated to save \$326,413.97 in 2035 when considering the total benefits of the CCAP Scenario's GHG reduction measures for avoided minor restricted activity days.

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County	\$ Acute Bronchitis	\$ AMI, Nonfatal (high)	\$ AMI, Nonfatal (low)	\$ Asthma Exacerb.	\$ Emergency Room Visits, Asthma	\$ Hosp. Admit., All Cardiovasc.	\$ Hosp. Admit., All Respiratory	\$ Lower Respiratory Symptoms	\$ Minor Restricted Activity Days	\$ Mortality, All Cause (low)	\$ Mortality, All Cause (high)	\$ Infant Mortality	\$ Upper Respiratory Symptoms	\$ Work Loss Days
Atlantic	393.99	77,588.77	8,351.75	884.97	202.65	6,077.94	4,232.71	219.51	30,113.83	5,839,856.22	13,235,314.54	37,273.11	495.10	11,573.51
Bergen	3,805.99	822,265.58	88,546.80	8,638.60	2,096.94	64,859.78	44,527.66	2,119.58	326,413.97	50,737,018.28	114,629,559.36	165,615.41	4,778.01	125,385.53
Burlington	842.32	191,001.38	20,561.35	1,916.72	552.71	21,439.36	12,023.51	468.67	70,674.79	13,830,891.48	31,279,330.86	56,031.63	1,054.78	27,093.94
Camden	1,468.44	209,900.47	22,598.16	3,245.61	417.62	17,625.60	11,020.68	817.47	105,907.81	20,027,325.79	45,390,260.04	134,828.12	1,841.43	40,942.53
Cape May	62.35	21,162.82	2,277.79	136.47	31.55	1,735.79	1,262.46	34.71	5,085.74	1,674,590.63	3,783,300.87	3,288.38	78.21	1,937.70
Cumberland	155.00	31,515.27	3,392.10	345.62	118.83	2,510.72	1,824.75	86.29	11,225.11	2,062,916.58	4,668,182.62	10,428.56	194.37	4,356.15
Essex	4,418.44	729,241.52	78,537.23	9,917.93	1,662.61	51,877.51	26,636.25	2,462.96	325,554.91	44,317,320.21	100,617,651.98	342,893.98	5,560.94	125,449.47
Gloucester	791.95	317,024.55	34,132.48	1,823.62	693.25	21,252.75	15,647.91	440.97	64,508.71	12,781,987.40	28,976,884.97	45,732.18	993.70	24,667.79
Hudson	2,671.76	412,533.83	44,420.98	5,733.31	2,249.48	40,452.07	22,286.79	1,485.25	225,786.56	22,510,175.29	50,887,666.28	149,679.22	3,337.93	89,175.73
Hunterdon	164.72	63,217.95	6,805.12	392.92	74.66	4,448.91	3,319.77	91.78	17,157.37	3,077,352.30	6,964,825.89	5,037.60	207.04	6,426.33
Mercer	1,067.66	253,659.21	27,309.95	2,461.59	558.55	18,784.38	12,871.53	594.26	86,307.93	13,221,922.22	29,942,820.12	90,588.99	1,338.26	33,276.99
Middlesex	3,918.31	799,974.51	86,152.77	9,016.90	685.62	38,764.86	29,216.89	2,182.83	330,986.48	47,060,174.26	106,493,611.69	173,557.70	4,923.34	128,513.30
Monmouth	1,788.05	493,927.00	53,178.86	4,078.06	1,186.85	38,769.33	26,197.62	996.43	147,628.56	28,617,466.66	64,718,964.17	80,438.55	2,248.46	56,158.22
Morris	1,128.20	291,334.40	31,363.88	2,556.56	392.75	22,472.30	13,192.23	628.60	95,146.54	16,056,843.04	36,277,502.95	37,245.32	1,417.99	36,313.24
Ocean	1,344.38	345,393.73	37,181.79	2,943.84	515.59	27,735.05	17,846.89	747.85	82,716.83	23,993,401.81	54,178,627.53	49,857.64	1,682.45	31,771.85
Passaic	1,434.83	197,541.82	21,266.87	3,251.26	263.43	14,700.01	8,584.61	799.27	103,312.83	14,743,965.81	33,394,229.58	72,945.75	1,802.33	39,948.31
Salem	66.59	20,716.87	2,229.90	148.22	27.51	1,383.68	896.72	37.05	4,965.92	1,212,798.09	2,740,880.99	2,277.96	83.41	1,898.42
Somerset	966.63	210,878.37	22,704.29	2,185.99	693.94	20,979.69	12,582.73	538.16	81,962.46	12,277,813.33	27,760,112.17	50,879.45	1,212.45	31,421.08
Sussex	139.00	37,335.93	4,018.69	321.95	82.46	2,900.46	2,272.08	77.43	12,800.93	2,516,874.17	5,693,301.92	6,917.46	174.58	4,838.81
Union	3,269.33	451,744.91	48,656.42	7,365.88	590.44	35,190.91	20,010.22	1,821.02	246,251.54	34,645,591.52	78,412,261.25	176,149.18	4,106.45	94,846.64
Warren	111.30	35,362.42	3,806.37	260.62	35.99	2,708.98	1,544.67	61.95	10,528.49	2,149,244.14	4,853,396.44	6,069.74	139.49	3,999.70
County Average	1,429.01	286,348.63	30,833.03	3,220.32	625.40	21,746.19	13,714.22	795.81	113,573.21	17,778,834.73	40,233,270.77	80,844.57	1,793.85	43,809.30
State Total	30,009.26	6,013,321.30	647,493.56	67,626.65	13,133.43	456,670.08	287,998.68	16,712.04	2,385,037.31	373,355,529.26	844,898,686.20	1,697,735.94	37,670.75	919,995.25

Table 10. Monetized Benefits, 2050, When Considering the Total Benefits of the CCAP Scenario's GHG reduction measures. Monetized annual health benefits for all counties in New Jersey based on this scenario of GHG Reduction Measures. All values are in 2024 dollars. For example, Bergen County is estimated to save \$957,458.45 in 2050 when considering the total benefits of GHG reduction measures for avoided minor restricted activity days.

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County	\$ Acute Bronchitis	\$ AMI, Nonfatal (high)	\$ AMI, Nonfatal (low)	\$ Asthma Exacerb.	\$ Emergency Room Visits, Asthma	\$ Hosp. Admit., All Cardiovasc.	\$ Hosp. Admit., All Respiratory	\$ Lower Respiratory Symptoms	\$ Minor Restricted Activity Days	\$ Mortality, All Cause (low)	\$ Mortality, All Cause (high)	\$ Infant Mortality	\$ Upper Respiratory Symptoms	\$ Work Loss Days
Atlantic	1,099.21	216,468.85	23,308.56	2,469.87	565.55	16,963.07	11,813.08	612.47	84,037.67	16,297,490.23	36,932,126.05	104,022.48	1,381.81	32,299.21
Bergen	11,153.53	2,409,781.06	259,792.89	25,346.83	6,151.76	190,311.75	130,649.78	6,213.47	957,458.45	148,837,611.52	336,137,053.50	485,884.45	14,019.84	367,843.85
Burlington	2,350.44	532,985.61	57,402.51	5,351.17	1,542.97	59,855.73	33,567.58	1,307.97	197,288.38	38,610,206.55	87,305,299.25	156,424.06	2,944.82	75,637.26
Camden	4,013.40	573,694.79	61,802.42	8,876.53	1,142.06	48,205.41	30,140.78	2,234.62	289,604.01	54,767,048.92	124,098,920.77	368,723.92	5,036.28	111,966.05
Cape May	177.44	60,226.47	6,483.46	388.46	89.80	4,940.80	3,593.48	98.80	14,475.40	4,766,404.97	10,767,774.21	9,359.90	222.62	5,515.36
Cumberland	437.57	88,966.68	9,577.80	975.90	335.53	7,089.28	5,152.36	243.61	31,693.42	5,824,609.37	13,179,582.55	29,445.43	548.83	12,299.67
Essex	12,957.12	2,138,628.92	230,625.29	29,126.10	4,881.74	152,353.31	78,222.27	7,225.35	955,731.36	130,115,036.98	295,279,476.42	1,006,852.86	16,331.57	368,345.79
Gloucester	2,169.07	868,322.02	93,542.49	4,997.92	1,899.81	58,247.16	42,885.37	1,207.97	176,768.96	35,027,162.71	79,391,003.58	125,329.01	2,723.44	67,600.74
Hudson	7,563.91	1,167,957.61	125,882.88	16,248.21	6,374.19	114,643.48	63,160.20	4,205.97	639,719.89	63,782,476.97	144,143,088.48	424,151.97	9,460.00	252,692.89
Hunterdon	464.96	178,444.80	19,216.26	1,109.55	210.82	12,563.15	9,374.54	259.10	48,444.87	8,689,342.20	19,663,544.22	14,224.88	584.67	18,146.07
Mercer	3,023.50	718,357.08	77,394.36	6,976.22	1,582.79	53,236.19	36,478.18	1,683.21	244,554.71	37,466,424.33	84,827,713.01	256,714.59	3,792.76	94,299.42
Middlesex	12,320.82	2,515,602.97	271,273.48	28,393.93	2,158.60	122,072.59	92,002.99	6,866.32	1,041,903.61	148,154,075.56	335,109,742.15	546,457.02	15,504.09	404,614.37
Monmouth	5,261.72	1,453,534.28	156,612.98	12,010.45	3,495.07	114,182.84	77,155.49	2,932.83	434,700.64	84,270,477.06	190,530,166.07	236,885.38	6,622.20	165,377.53
Morris	3,178.20	820,725.52	88,406.01	7,206.45	1,107.00	63,345.75	37,186.28	1,771.09	268,159.44	45,256,257.87	102,228,364.55	104,981.43	3,997.12	102,352.32
Ocean	3,834.95	985,281.96	106,116.37	8,401.90	1,471.44	79,158.24	50,936.04	2,133.59	236,049.17	68,472,443.14	154,589,938.91	142,290.00	4,801.89	90,673.09
Passaic	3,930.09	541,092.78	58,287.08	8,911.16	721.97	40,290.73	23,528.95	2,189.62	283,118.97	40,406,217.09	91,499,205.90	199,920.44	4,939.98	109,483.12
Salem	192.00	59,736.00	6,431.43	427.49	79.34	3,990.85	2,586.34	106.85	14,321.84	3,497,806.86	7,904,230.72	6,569.97	240.58	5,475.28
Somerset	2,738.74	597,498.68	64,375.74	6,198.38	1,967.48	59,488.91	35,678.25	1,525.08	232,361.40	34,809,126.85	78,684,109.05	144,258.94	3,438.00	89,086.34
Sussex	393.30	105,641.75	11,373.83	911.20	233.38	8,209.14	6,430.58	219.10	36,227.58	7,123,082.40	16,111,343.70	19,577.79	494.13	13,694.67
Union	10,040.20	1,387,411.43	149,663.12	22,658.66	1,815.91	108,256.43	61,554.50	5,594.84	757,205.45	106,544,811.72	241,013,078.24	541,783.08	12,632.74	291,705.54
Warren	311.77	99,057.04	10,665.46	730.26	100.84	7,590.73	4,328.23	173.54	29,499.06	6,021,954.01	13,597,352.29	17,007.22	390.85	11,206.92
County Average	4,172.00	834,257.92	89,915.92	9,415.08	1,806.10	63,095.03	39,829.78	2,324.07	332,063.06	51,844,765.11	117,285,386.36	235,279.28	5,243.25	128,110.26
State Total	87,611.94	17,519,416.30	1,888,234.42	197,716.66	37,928.05	1,324,995.56	836,425.29	48,805.42	6,973,324.29	1,088,740,067.28	2,462,993,113.63	4,940,864.83	110,108.20	2,690,315.48

Appendix C – List of Literature Review Search Terms

The list of terms below were preliminary to get the initial sweep of the literature for the full population. Additional searches were conducted to collect the most up to date and relevant research.

Terms re: the Affected Populations:

- New Jersey, urban, rural, suburban, community, elderly, older adults, child, children, infant

Terms re: CCAP Measures and Enabling Actions:

- greenhouse gas reduction measures, emissions reduction measures, criteria pollution, diesel pollution, transportation emissions, MHDV charging hubs, electric vehicles, ride sharing, ride hailing, EV charging station, multi-unit dwelling (multi-family housing), fleet, workforce, distributed energy resources (DER), pathways + electricians, tree, tree + inventory, tree + database, tree + maintenance, parks, food pantry, food pantry + composter, food pantry + carbon neutral, wastewater treatment + anerobic digester, wastewater treatment + energy recovery, vehicle miles traveled, VMT, solar, off-shore wind, nuclear energy, battery storage, demand management + electricity demand, congestion pricing, electrification + buildings + vehicles, space heating, water heating

Terms re: Impacts of Concern

- benefit, disbenefit, negative, public health, health, illness, disease, stress, mental health, noise, well-being, socioeconomics, crime, employment, job, training, workforce development, safety, pollutants, pollution, waste, access, beautification, energy cost, energy demand, energy security, capacity building, cancer, acute respiratory symptoms, restricted activity days, minor RAD, asthma, emergency room visits, cardiovascular, hospitalizations

Additional phrases that were searched:

- “workforce training” programs for electric vehicle charging stations; impact of high GWP hydrofluorocarbons, halogenated gases, halogenated on “human health”; health risks of transitioning from using refrigerants with high GWP; “farm” “emission reduction” “tree”; planting trees on “grazing land”; “farm” “emission reduction” “tree” “mental health”; and distributed energy resources, human health impacts

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Appendix D – Municipalities with AIOBCs

OBCs are based on sociodemographic factors from the U.S. Census Bureau’s 5-year American Community Survey (ACS). NJDEP calculates AIOBCs from an analysis of 26 stressors values in OBCs against the median values in non-OBCs. The AIOBCs were updated in January of 2025 using new ACS data as well as new stressor data. New ACS data causes OBC designations to change with some communities being added and some dropped. Several of the 26 stressors had new data at this time as well. Updated ACS and stressor data caused 265 communities to be added as AIOBCs in 2025 with 174 dropping out. The list below reflects the up-to-date list of municipalities with AIOBCs in New Jersey. The list is organized by county and municipality within that county.

County	Municipality	Municipality Code
ATLANTIC	Absecon City	0101
ATLANTIC	Atlantic City	0102
ATLANTIC	Brigantine City	0103
ATLANTIC	Buena Borough	0104
ATLANTIC	Buena Vista Township	0105
ATLANTIC	Egg Harbor City	0107
ATLANTIC	Egg Harbor Township	0108
ATLANTIC	Galloway Township	0111
ATLANTIC	Hamilton Township	0112
ATLANTIC	Hammonton Town	0113
ATLANTIC	Margate City	0116
ATLANTIC	Mullica Township	0117
ATLANTIC	Pleasantville City	0119
ATLANTIC	Somers Point City	0121
ATLANTIC	Ventnor City	0122
BERGEN	Bergenfield Borough	0203
BERGEN	Bogota Borough	0204
BERGEN	Carlstadt Borough	0205
BERGEN	Cliffside Park Borough	0206
BERGEN	Closter Borough	0207
BERGEN	Cresskill Borough	0208
BERGEN	Demarest Borough	0209
BERGEN	Dumont Borough	0210
BERGEN	East Rutherford Borough	0212
BERGEN	Edgewater Borough	0213
BERGEN	Elmwood Park Borough	0211
BERGEN	Emerson Borough	0214
BERGEN	Englewood City	0215
BERGEN	Englewood Cliffs Borough	0216
BERGEN	Fair Lawn Borough	0217
BERGEN	Fairview Borough	0218
BERGEN	Fort Lee Borough	0219
BERGEN	Garfield City	0221
BERGEN	Glen Rock Borough	0222
BERGEN	Hackensack City	0223
BERGEN	Hasbrouck Heights Borough	0225
BERGEN	Haworth Borough	0226

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BERGEN	Leonora Borough	0229
BERGEN	Little Ferry Borough	0230
BERGEN	Lodi Borough	0231
BERGEN	Lyndhurst Township	0232
BERGEN	Mahwah Township	0233
BERGEN	Maywood Borough	0234
BERGEN	Moonachie Borough	0237
BERGEN	New Milford Borough	0238
BERGEN	North Arlington Borough	0239
BERGEN	Northvale Borough	0240
BERGEN	Norwood Borough	0241
BERGEN	Palisades Park Borough	0245
BERGEN	Paramus Borough	0246
BERGEN	Ramsey Borough	0248
BERGEN	Ridgefield Borough	0249
BERGEN	Ridgefield Park Village	0250
BERGEN	Ridgewood Village	0251
BERGEN	River Edge Borough	0252
BERGEN	Rochelle Park Township	0254
BERGEN	Rockleigh Borough	0255
BERGEN	Rutherford Borough	0256
BERGEN	Saddle Brook Township	0257
BERGEN	South Hackensack Township	0259
BERGEN	Teaneck Township	0260
BERGEN	Tenafly Borough	0261
BERGEN	Teterboro Borough	0262
BERGEN	Wallington Borough	0265
BERGEN	Westwood Borough	0267
BERGEN	Wood-Ridge Borough	0269
BURLINGTON	Beverly City	0302
BURLINGTON	Bordentown City	0303
BURLINGTON	Bordentown Township	0304
BURLINGTON	Burlington City	0305
BURLINGTON	Burlington Township	0306
BURLINGTON	Cinnaminson Township	0308
BURLINGTON	Delanco Township	0309
BURLINGTON	Delran Township	0310
BURLINGTON	Edgewater Park Township	0312
BURLINGTON	Florence Township	0315
BURLINGTON	Hainesport Township	0316
BURLINGTON	Lumberton Township	0317
BURLINGTON	Maple Shade Township	0319
BURLINGTON	Moorestown Township	0322
BURLINGTON	Mount Holly Township	0323
BURLINGTON	Mount Laurel Township	0324
BURLINGTON	North Hanover Township	0326
BURLINGTON	Palmyra Borough	0327
BURLINGTON	Riverside Township	0330
BURLINGTON	Westampton Township	0337

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BURLINGTON	Willingboro Township	0338
BURLINGTON	Wrightstown Borough	0340
CAMDEN	Audubon Park Borough	0402
CAMDEN	Bellmawr Borough	0404
CAMDEN	Berlin Borough	0405
CAMDEN	Berlin Township	0406
CAMDEN	Brooklawn Borough	0407
CAMDEN	Camden City	0408
CAMDEN	Cherry Hill Township	0409
CAMDEN	Clementon Borough	0411
CAMDEN	Collingswood Borough	0412
CAMDEN	Gloucester City	0414
CAMDEN	Gloucester Township	0415
CAMDEN	Haddon Township	0416
CAMDEN	Lawnside Borough	0421
CAMDEN	Lindenwold Borough	0422
CAMDEN	Magnolia Borough	0423
CAMDEN	Merchantville Borough	0424
CAMDEN	Pennsauken Township	0427
CAMDEN	Runnemede Borough	0430
CAMDEN	Somerdale Borough	0431
CAMDEN	Stratford Borough	0432
CAMDEN	Voorhees Township	0434
CAMDEN	Waterford Township	0435
CAMDEN	Woodlynne Borough	0437
CAPE MAY	Lower Township	0505
CAPE MAY	Middle Township	0506
CAPE MAY	North Wildwood City	0507
CAPE MAY	Ocean City	0508
CAPE MAY	West Wildwood Borough	0513
CAPE MAY	Wildwood City	0514
CAPE MAY	Woodbine Borough	0516
CUMBERLAND	Bridgeton City	0601
CUMBERLAND	Deerfield Township	0603
CUMBERLAND	Fairfield Township	0605
CUMBERLAND	Hopewell Township	0607
CUMBERLAND	Millville City	0610
CUMBERLAND	Upper Deerfield Township	0613
CUMBERLAND	Vineland City	0614
ESSEX	Belleville Township	0701
ESSEX	Bloomfield Township	0702
ESSEX	Caldwell Borough	0703
ESSEX	City Of Orange Township	0717
ESSEX	East Orange City	0705
ESSEX	Glen Ridge Borough	0708
ESSEX	Irvington Township	0709
ESSEX	Livingston Township	0710
ESSEX	Maplewood Township	0711
ESSEX	Millburn Township	0712

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ESSEX	Montclair Township	0713
ESSEX	Newark City	0714
ESSEX	Nutley Township	0716
ESSEX	South Orange Village Township	0719
ESSEX	West Orange Township	0722
GLOUCESTER	Deptford Township	0802
GLOUCESTER	Franklin Township	0805
GLOUCESTER	Glassboro Borough	0806
GLOUCESTER	Greenwich Township	0807
GLOUCESTER	Harrison Township	0808
GLOUCESTER	Logan Township	0809
GLOUCESTER	Monroe Township	0811
GLOUCESTER	Paulsboro Borough	0814
GLOUCESTER	Swedesboro Borough	0817
GLOUCESTER	Washington Township	0818
GLOUCESTER	West Deptford Township	0820
GLOUCESTER	Westville Borough	0821
GLOUCESTER	Woodbury City	0822
HUDSON	Bayonne City	0901
HUDSON	East Newark Borough	0902
HUDSON	Guttenberg Town	0903
HUDSON	Harrison Town	0904
HUDSON	Hoboken City	0905
HUDSON	Jersey City	0906
HUDSON	Kearny Town	0907
HUDSON	North Bergen Township	0908
HUDSON	Secaucus Town	0909
HUDSON	Union City	0910
HUDSON	Weehawken Township	0911
HUDSON	West New York Town	0912
HUNTERDON	Flemington Borough	1009
HUNTERDON	Readington Township	1022
MERCER	East Windsor Township	1101
MERCER	Ewing Township	1102
MERCER	Hamilton Township	1103
MERCER	Hightstown Borough	1104
MERCER	Hopewell Township	1106
MERCER	Lawrence Township	1107
MERCER	Princeton	1114
MERCER	Trenton City	1111
MERCER	West Windsor Township	1113
MIDDLESEX	Carteret Borough	1201
MIDDLESEX	Cranbury Township	1202
MIDDLESEX	Dunellen Borough	1203
MIDDLESEX	East Brunswick Township	1204
MIDDLESEX	Edison Township	1205
MIDDLESEX	Highland Park Borough	1207
MIDDLESEX	Metuchen Borough	1209
MIDDLESEX	Middlesex Borough	1210

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MIDDLESEX	Milltown Borough	1211
MIDDLESEX	Monroe Township	1212
MIDDLESEX	New Brunswick City	1213
MIDDLESEX	North Brunswick Township	1214
MIDDLESEX	Old Bridge Township	1215
MIDDLESEX	Perth Amboy City	1216
MIDDLESEX	Piscataway Township	1217
MIDDLESEX	Plainsboro Township	1218
MIDDLESEX	Sayreville Borough	1219
MIDDLESEX	South Amboy City	1220
MIDDLESEX	South Brunswick Township	1221
MIDDLESEX	South Plainfield Borough	1222
MIDDLESEX	South River Borough	1223
MIDDLESEX	Woodbridge Township	1225
MONMOUTH	Aberdeen Township	1301
MONMOUTH	Asbury Park City	1304
MONMOUTH	Bradley Beach Borough	1308
MONMOUTH	Eatontown Borough	1312
MONMOUTH	Freehold Borough	1316
MONMOUTH	Freehold Township	1317
MONMOUTH	Hazlet Township	1318
MONMOUTH	Howell Township	1321
MONMOUTH	Keansburg Borough	1323
MONMOUTH	Keyport Borough	1324
MONMOUTH	Long Branch City	1327
MONMOUTH	Manalapan Township	1328
MONMOUTH	Marlboro Township	1330
MONMOUTH	Matawan Borough	1331
MONMOUTH	Neptune City Borough	1336
MONMOUTH	Neptune Township	1335
MONMOUTH	Ocean Township	1337
MONMOUTH	Red Bank Borough	1339
MONMOUTH	Tinton Falls Borough	1349
MORRIS	Boonton Town	1401
MORRIS	Butler Borough	1403
MORRIS	Dover Town	1409
MORRIS	East Hanover Township	1410
MORRIS	Florham Park Borough	1411
MORRIS	Hanover Township	1412
MORRIS	Lincoln Park Borough	1416
MORRIS	Madison Borough	1417
MORRIS	Montville Township	1421
MORRIS	Morris Township	1422
MORRIS	Morristown Town	1424
MORRIS	Netcong Borough	1428
MORRIS	Parsippany-Troy Hills Township	1429
MORRIS	Randolph Township	1432
MORRIS	Rockaway Township	1435
MORRIS	Roxbury Township	1436

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MORRIS	Victory Gardens Borough	1437
MORRIS	Wharton Borough	1439
OCEAN	Berkeley Township	1506
OCEAN	Brick Township	1507
OCEAN	Jackson Township	1512
OCEAN	Lacey Township	1513
OCEAN	Lakewood Township	1515
OCEAN	Manchester Township	1519
OCEAN	Seaside Heights Borough	1527
OCEAN	South Toms River Borough	1530
OCEAN	Toms River Township	1508
PASSAIC	Bloomingdale Borough	1601
PASSAIC	Clifton City	1602
PASSAIC	Haledon Borough	1603
PASSAIC	Hawthorne Borough	1604
PASSAIC	Little Falls Township	1605
PASSAIC	North Haledon Borough	1606
PASSAIC	Passaic City	1607
PASSAIC	Paterson City	1608
PASSAIC	Prospect Park Borough	1610
PASSAIC	Totowa Borough	1612
PASSAIC	Wanaque Borough	1613
PASSAIC	Wayne Township	1614
PASSAIC	Woodland Park Borough	1616
SALEM	Carneys Point Township	1702
SALEM	Penns Grove Borough	1708
SALEM	Pennsville Township	1709
SALEM	Salem City	1713
SOMERSET	Bound Brook Borough	1804
SOMERSET	Bridgewater Township	1806
SOMERSET	Franklin Township	1808
SOMERSET	Green Brook Township	1809
SOMERSET	Hillsborough Township	1810
SOMERSET	Manville Borough	1811
SOMERSET	Montgomery Township	1813
SOMERSET	North Plainfield Borough	1814
SOMERSET	Raritan Borough	1816
SOMERSET	Somerville Borough	1818
SOMERSET	South Bound Brook Borough	1819
SOMERSET	Warren Township	1820
SUSSEX	Hamburg Borough	1909
SUSSEX	Hopatcong Borough	1912
SUSSEX	Newton Town	1915
SUSSEX	Sussex Borough	1921
UNION	Clark Township	2002
UNION	Elizabeth City	2004
UNION	Fanwood Borough	2005
UNION	Garwood Borough	2006
UNION	Hillside Township	2007

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UNION	Kenilworth Borough	2008
UNION	Linden City	2009
UNION	New Providence Borough	2011
UNION	Plainfield City	2012
UNION	Rahway City	2013
UNION	Roselle Borough	2014
UNION	Roselle Park Borough	2015
UNION	Scotch Plains Township	2016
UNION	Springfield Township	2017
UNION	Summit City	2018
UNION	Union Township	2019
UNION	Westfield Town	2020
WARREN	Greenwich Township	2107
WARREN	Hackettstown Town	2108
WARREN	Lopatcong Township	2115
WARREN	Mansfield Township	2116
WARREN	Phillipsburg Town	2119
WARREN	Washington Borough	2121

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Appendix F – Detailed Stakeholder Engagement Notes

Below are representative stakeholder engagement responses to the questions that were asked of stakeholders during the public engagement sessions for the 2025 New Jersey CCAP.

- I. What needs to happen and/or be in place for communities to have an effective role in responding to climate issues? What does giving communities ownership of climate action look like?

Participants across all three sessions generally emphasized the need for more education and awareness about both how the climate crisis is an immediate problem that impacts people's lives through air pollution and health impacts as well as the incentives, guidance, and decision-making processes that are key to solving these problems and reducing emissions. Part of this involves letting more scientists take the lead in communication, and having more sessions and conversations like this one, that bring people from different backgrounds and parts of the state together to learn from each other. Developing more outreach materials in Spanish. Utilizing social media across multiple platforms and coordinating with other localized and grassroots organizations that might have a stronger presence on a certain app and further reach within NJ communities that are historically underreported in environmental decisions. It was noted that environmental justice and overburdened communities (OBCs) in South Jersey have little or no capacity to organize to push clean energy projects through the long development timeline.

Understanding local government, land use decisions and development process

Attendees in multiple sessions pointed out that people need more knowledge of their local planning and zoning boards which control development decisions that have negative impacts such as increased air pollution. Attendees suggested the DEP could host in-person, "Your Planning and Zoning Boards: 101" seminars and develop short, accessible digital educational materials that helped people understand how decisions are made about what gets developed where in their communities.

- *"Part of the education that's needed is how to read your cities master plan, knowing who's involved in the development process. This includes learning which careers people can pursue to get involved and make change. So people know that if you're pissed about warehouses, you're going to have to deal with them by understanding the process for how they get developed. Once certain development decisions happen you often can't change them for years and they're going to impact the community long term... So its people learning about the levers that effect decision-making and getting involved."*

Additionally, attendees noted there is generally a lack of expertise in planning and zoning departments in being able to look at land use decisions from a

sustainable lens and suggested that the State could mandate that planning boards and zoning boards evaluate land use applications based on climate-smart lens, using a list of land use criteria.

- *“We need to give local planning and zoning departments the tools to evaluate decisions based on climate-smart criteria.”*

2. Are you concerned about land use development decisions or the development of natural lands in your community that have an impact on ecosystems and greenhouse gas emissions?

Exploitation, exclusion, denied access and rights to forage

Attendees noted in South Jersey, particularly Salem County there are many large farms that do not adequately serve the local community and stressed that these and other private developments along with state policies prevent Indigenous people from foraging on the land and prevent people from connecting with and properly stewarding the land. Participants spoke about Bill A5372, introduced in the NJ state legislature, which would allow individuals to forage for fruits, fungi, nuts, plants, and parts thereof for their personal use within state parks and forests.

- *“Native communities feel exploited. There are no ways to collect natural resources. Land policy conversations often exclude native communities.”*
- *“We cannot go and pick pine needles for pine needle baskets.”*
- *“We overlook and don’t often understand the relationship between Indigenous people’s connection to the land. We tear down opportunities to connect with people and nature all the time. Indigenous people have a connection with the land, where the land is part of the family and home. Black communities have stewarded this land and were historically denied the same access to land. Protecting this land is so important. There is no greater good for degrading the land, and it comes with many consequences. Ecotourism is a huge part of funding that benefits the state, as natural lands continue to be degraded and resources are continually disrupted, NJ communities can expect negative economic impacts.”*

One participant told of their experience trying to purchase native fruit trees from a NJ tree nursery:

- *“Not one nursery in NJ would sell to us. They told us they only sold them to commercial businesses... We had to drive to PA to ultimately buy a tree grown in Hopewell, NJ.”*

Their experience emphasizes the need for more or expanded State tree nurseries and potential changes to policies surrounding the sale of native trees to non-commercial buyers at NJ tree farms.

Another participant highlighted that people often mistakenly only refer to ‘untouched lands’ when considering natural lands, and that adopting a more expansive definition of natural lands is

needed to not exclude from these discussions urban communities where there is often a disproportionate share of abandoned or underdeveloped lands.

Environmental concerns from large farming operations in South Jersey

Attendees voiced other pollution and public health concerns posed by large farms as well.

- *“Saltwater erosion is an issue in the local aquifer in Salem County because nearby farms are planting foreign tree species that require a lot of local water resources. Many companies want to take the land, come through with diesel trucks that pollute the town and the water. They’re spraying pesticides and herbicides used at nearby farms, neighbors have to close their windows. These are contributing to health concerns in the community. There are high rates of Parkinson’s and other autoimmune diseases and cancer in local communities in Salem County because of the harmful effects from pollution. No one is checking the farming industry because of the services it provides to the economy. Our farming is no longer a mosaic farm where you have corn, squash beans and tomatoes... You just have one crop. And it’s killing the birds, the lightning bugs, and the frogs. No one is paying attention to what is happening in South Jersey.”*

Brownfields and other industrial development concerns

Attendees mentioned concerns around plans for new warehouses, a new natural gas pipeline in the South Brunswick area, and a new concrete manufacturing facility on a capped landfill in Salem County. Attendees were also concerned about policies that disincentivize clean-up of brownfields and in-fill redevelopment of vacant land, leading to greenfield development and sprawl that increases emissions and reduces carbon sinks.

- *“Especially when it comes to brownfields, municipalities are often penalized for cleaning them up. For instance, needing to continue to pay the cleanup assessment fees after it’s done is burdensome; plus even getting the initial assessment done to see if a site is contaminated triggers the requirement to remediate which can add cost to municipalities that often don’t have any capacity or funds. So many just do not get assessed. There are structural levers the state and municipalities could put in place to help bring more of these properties back into constructive use.”*

3. What do you know of NJ's plans to make fair access to clean and affordable energy available (such as home energy-savings programs)? How would you like to see home electrification and energy incentive programs expanded?

Larger rebates and more of them.

Attendees believed rebates are too low and do not cover enough things. Rebates need to be more realistic in terms of making the switch to electric or more efficient equipment “actually affordable” for low- and moderate-income people. People need increased incentives and more

types of rebates for energy efficiency and electrification to be able to invest in clean energy solutions. People's quality of life are being impacted, and electrifying is essential, but right now it is also expensive. Participants cited how they want renewable energy, and have installed solar and geothermal heat pumps but are seeing increases to their energy costs. The group was concerned that low-income communities were being saddled with costs of energy transition while not seeing savings and still bearing disproportionate impact from existing fossil fuel infrastructure.

- *“DEP, BPU and the NJ Governor’s Office need to make this affordable. At the end of the day, people don’t care about PJM, interconnection or other reasons for why the costs are high. I am trying to make the case to people that we need renewables and that pollution is killing them, but their pockets are killing them. We need more significant rebates.”*
- *“Affordability is always going to be the focus. If we can’t make clean energy affordable than we can’t make the case to make renewables happen.”*

Incentivizing retrofits and whole of home building upgrades for landlords and protect renters against displacement

Attendees who were renters in south jersey voiced that they don’t feel like these incentive programs can benefit them because the landlord is the decision maker. Actions need to be taken to ensure renters can see the benefits from landlords making improvements without hiking up rents after. Attendees voiced support for expanding the Trenton Whole Homes pilot statewide and doing more to require accountability and incentivize apartment buildings to fix mold asbestos, structural repairs in addition to energy efficiency and electrification improvements.

Prioritize infrastructure upgrades needed to bring clean energy to certain communities

Participants were concerned about delays to a community solar project (Carneys Point) in Salem County due to infrastructure upgrades, and that the costs of these upgrades may get passed on to the subscribers and cancel out any potential energy cost savings. Attendees noted that most South Jersey communities do not have the capacity to push clean energy projects through the finish line even when they get them approved:

- *“Salem County is one of the poorest counties in the state, and an EJ community where people aren’t organized in the capacity to speak up and advocate as strongly to get a [clean energy or community solar] project moving again and getting the investments needed.”*

Educating EJ communities about energy savings and efficiency

Attendees discussed how education is also important; incentives are often missed out on because they are not advertised well. NJDEP shared that the State is soon developing a ‘one-stop-shop’ website for accessing home energy incentives and rebates. Others mentioned the need to do more basic education among people in low income, OBCs.

- *“Education is not getting in to the EJ communities. When I go into homes, people have everything plugged in, and are not aware of the little, easier things that can save a lot of energy (and money). Using less electricity is a large piece of the puzzle, not just electrifying everything and hoping clean energy sources are used over fossil fuels.”*

4. What alternative ‘clean’ or zero-emission energy sources should NJ pursue to meet future electricity demand?

Attendees voiced the need to still develop off shore wind and champion these renewable solutions over continuation of fossil fuels. There was confusion over why the NJ Offshore Wind projects in development were cancelled and they desired more transparency from state agencies over the current status of projects and ongoing plans. Participants emphasized the need to dispel myths and untruths around off shore wind with scientists directly leading the messaging to communities across the state.

- *“We need these wind farms off the coast for renewable energy.”*

Across all sessions, attendees voiced opposition to the state continuing to consider incinerators as “clean energy.” Several attendees voiced opposition to NJ pursuing nuclear energy, hydrogen and liquified natural gas as ways to reach clean energy and emissions goals, and that the state should prioritize solar, wind and battery storage exclusively.

5. In addition to electric municipal and school buses, do options like eBikes and scooters appeal to you?

In certain communities such as small cities, more urbanized towns and suburbs such as Glassboro, attendees felt that micromobility options like these could be more useful compared to other communities in South Jersey that are more rural and have narrower roadways without shoulders. Attendees across all meetings generally felt that eBikes and scooters would appeal to them more if the roads and infrastructure (like bike lanes) in their communities were safer and more interconnected. DEP heard general support for more bicycle, pedestrian, and ‘complete streets’ infrastructure that makes roads safer for all users. Several participants suggested there should be rebate programs for eBikes similar to those for electric vehicles, especially for those who live in ‘transit deserts’ or for those who can’t afford a car. Attendees felt that micromobility and eMobility solutions can be particularly helpful for connecting people to existing transit hubs and destinations via ‘first and last mile’.

- *“In some cases (bike infrastructure) it’s just not feasible. Some of the distances [in South Jersey communities] are too far. 20 miles? I’d never make it if I tried to take a bike. I would rather take my horse, it’d be faster.”*
- *“Folks can take public transit to as close as they can get and then get on service that can be reliable in getting someone to their specific destination. This could be where microtransit, eMobility etc. come into play.”*

School Bus electrification

Participants emphasized that efforts to support and expand micromobility should not detract from electrification:

- *“While I believe in micromobility options being a solution, we shouldn’t dismiss what still needs to happen with bus electrification though... especially school buses. [Electrification] is happening but it needs to happen faster. We’re seeing 1 to 2 buses getting electrified. Making this change is a significant improvement for our communities. Its something we can do, that needs to get done. If we love children, we need to get that to happen. Otherwise what we’re doing is incongruent with what we’re saying.”*

Other attendees felt that towns aren’t aware of or don’t see enough grants for school bus electrification. One attendee raised concerns about electric vehicles not meeting the needs of certain low-income, rural communities, especially with regards to having the necessary range and not being about to withstand flooding that occurs often in communities in South Jersey. For this reason, they emphasized the need to explore other options such as hydrogen fuel-cell, natural gas-powered vehicles and light-rail transit options.

6. What initiatives would you like to see to expand public transit services and access to more folks in communities in South Jersey?

Attendees voiced support for the Glassboro-Camden light rail expansion as well as bus-rapid transit (BRT) service in South Jersey. Some cited the possibility of electrified Jitney services that would connect shore towns and towns more in-land as well as reviving existing rail lines for use as passenger rail service that connects communities. Overall, participants noted there is a deficit of transit in South Jersey both in terms of service and infrastructure.

- *“We have a deficit in South Jersey. There’s a loss of economic opportunities when people don’t have an ability to get from point A to point B. The difference in SJ is not that the existing structures need to be updated, its that they just don’t exist. These two counties (Salem and Cumberland) for example don’t have reliable ways for people to get back and forth, other than by car.”*
- *“We need for more bus stops and stations in South Jersey (Burlington County specifically). We need them to go later at night because current times are often unrealistic for many job schedules for working people.”*
- *“We lost a lot of factories in South Jersey since the 1980s and our glass production companies have downsized. Rail transportation is the way it used to be in South Jersey with trolley lines etc. We have the existing rail lines in place, or are still in use [from these industries] and were supposed to double as passenger light rail system but for some reason they didn’t.”*
- *“I still think that bus will be the way that people [in South Jersey] get around. But NJ Transit has not been able to make it [bus transit service] efficient and reliable... NJ*

Transit needs to make use of the technology that lets you know when a bus is coming and those that help optimize routes.”

7. What is your understanding of the term "zero-waste initiatives"? Can this approach help to address the impacts of incinerators?

Attendees noted they agreed with the definition of zero-waste posed by DEP. Overall participants emphasized the need to remove the ability for incinerators to receive renewable energy credits (RECs). This would require state legislative action. Attendees felt that this change would pave the way for shutting down these facilities that disproportionately impact Black and Brown communities. Attendees cited that incinerators are private businesses that take in waste from other states to meet quotas. Other priorities voiced by participants included: that NJ needs to stop accepting waste from non-NJ sources; needs to legalize and reduce regulatory barriers to composting and institute policies to incorporate composting into our recycling and disposal routines; mandating that companies use alternatives that are recyclable or reusable.

- *“The big issue is that incinerators are getting renewable energy credits for burning trash... We need to stop incentivizing them to bring in more trash and to burn it for energy and call that renewable.”*
- *“We have 3 incinerators in our state and most of the waste is coming from out of state, and its forcing our Black and Brown communities to bear the brunt of pollution from those facilities. They only provide a small portion of NJ’s electricity. It would be great to not allow incinerators to receive RECs. California has already done this. This would pave the way for not allowing incinerators to operate in our state.”*

Recycling, plastics and education

Attendees noted that there is a lot of consumer deception around what is recyclable and how much (particularly plastic) recycled material actually gets recycled. People noted the need to further address the emissions associated with transporting materials to recycling facilities and also reducing the amount of non-recyclables and other waste in upstream through incentives and policies that consider alternatives like glass bottles, reusable containers and considering deposit systems. Attendees also voiced the need for greater education around how to recycle hazardous waste and eWaste materials and how to ensure they do not end up incinerated and polluting our air. DEP noted the recycle coach web-based platform and the Recycle Coach App that currently exist to assist residents with understanding how to properly recycle various materials in their community.

- *“Stop incentivizing bringing in more trash. When they don’t reach their quota, they burn recyclables. We are allowing profit over common sense. We need to mandate that companies spend money on things that can actually be recycled. We also need to expand composting.”*

8. What would you like to see NJ develop in terms of effective local training for good-paying jobs in a green economy? What workforce strategies could bring residents of your community cutting-edge training and good-paying jobs in New Jersey's green economy?

Attendees felt that workforce development should be done on a community-level— with the State giving incentives to employers for green jobs and empowering communities to answer these workforce questions for themselves. General consensus was there is no one-size fits all, model approach that works for all communities in the state. Participants also spoke about the need for a “one-stop-shop” of information on available training programs, apprenticeship and job opportunities for both job-seekers and trainers or career advisors in addition to providing incentives and direct funding for residents to undertake said training.

- *“Years ago, companies used to certify employees. You didn’t have to go to trade schools to get a license, companies used to pay for that. This should be considered when developing the green workforce initiatives now.”*
- *“We need to provide incentives to companies to hire our community members.”*

One participant noted the power that unions have in controlling decisions about workforce development opportunities and equity in hiring in NJ's green economy:

- *“At the end of the day the unions dominate these jobs. There are no third party providers. There needs to be conversation about just how much the unions are controlling the green economy. When it comes to state contract proposals you have to show the state you have union buy-in for your projects. If unions are dominating all that work (particularly around off-shore wind contracts for example) unless you go through a union pre-apprenticeship you aren’t getting those jobs.”*
- *“Unions need to start diversifying their hiring practices, but I’ve heard unions say they don’t want to. Many of these unions are reluctant to support a ‘just transition’, yet they are the ones who are getting all the agreements for OSW and other new green development. We need to better figure out each union local’s hiring practices, they are all different and there’s no “one-stop shop” for trainers to know where the openings are. If there’s a way to sit down with [Department of Labor] and some of these union leaders, that would be helpful and where we need to start.”*

9. Are you concerned about the air pollution and climate impacts of trucks and warehousing in your communities?

Attendees across all sessions cited concerns about new warehouse developments which came with large dump trucks and associated emissions and traffic congestion. Some participants were concerned about specific potential emissions violations from trucks and other sources in their community and weren’t sure who to contact about that. DEP shared the WARN DEP enforcement hotline 1-877- WARN DEP (1-877-927-6337) to report incidents including emissions, chemical releases, wildlife issues or other type of environmental concern.

- *“When I worked for a warehousing company many years ago, we were around diesel trucks multiple hours a day, when I used to come home (in Gloucester county) a lot of time people would develop breathing issues from exposure to that. If you live by these facilities a lot of the air pollution is blown into peoples houses, windows and yard.”*
- *“They always want to put warehouses in these smaller communities where the roads are not large enough for these trucks. They put a warehouse behind my dads’ and there’s been an increase in truck traffic congestion.”*
- *“Townships are looking for rateables. They are going against the township zoning (allowing [warehouses in residential districts]) in order to get rateable benefits. There could be some legislative actions the state could take to regulate this.”*

10. What would you like to see state agencies like NJ DEP, Forest Service, and the NJ Dept of Agriculture do to empower more farmers and producers—especially Indigenous and farmers and producers of color—to be leaders in and benefit from climate action?

One attendee cited that increased access to capital was one thing they’d like to see. Another participant voiced frustrations related to State involvement in supporting large farming operations in South Jersey that have caused a lot of the problems they are seeing in their communities, while applying restrictions to people’s ability to engage in smaller-scale farming or food production. They cited how runoff from large farms poses issues to waterways and animals on these farms spread diseases when they don’t have the proper room to roam.

- *“There is no revenue in farming. People are supporting large farms, not small farms. There are benefits in small homesteading — locally feeding each other is important. There are laws and ordinances against gardening and farming in your own front yard. The state should be deregulating things that block people from being able to contribute to their stewardship of the land.”*



APPENDIX E

WORKFORCE PLANNING ANALYSIS REPORT



RUTGERS–NEW BRUNSWICK

**Edward J. Bloustein School
of Planning and Public Policy**

John J. Heldrich Center for Workforce Development

Comprehensive Climate Action Plan: Workforce Planning Analysis

Prepared by the John J. Heldrich Center for Workforce Development

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Executive Summary

The New Jersey Department of Environmental Protection (NJDEP) contracted Rutgers, The State University of New Jersey, to assist with the development of New Jersey's Comprehensive Climate Action Plan (CCAP) for submission to the United States Environmental Protection Agency (USEPA). The CCAP will serve as New Jersey's overarching strategy to reduce greenhouse gas emissions across multiple key sectors, with the goal of achieving an 80 percent reduction by the year 2050. As part of this effort, the John J. Heldrich Center for Workforce Development was engaged by the Climate Change Resource Center (CCRC) at Rutgers University to conduct a Workforce Planning Analysis for inclusion in the CCAP. The Heldrich Center for Workforce Development leads research and policy focused on workforce development, education, and labor market issues.

The Workforce Planning Analysis is a critical component of the CCAP that identifies workforce development strategies that align with and support action for the eight sectors in New Jersey's. For the Workforce Planning Analysis, the Heldrich Center applied a four-pronged research approach that includes: analyzing the State's green economy labor market, updating its inventory of education and training programs relevant to NJDEP's eight sectors, identifying barriers that underserved populations may experience in accessing opportunities in the Green Economy, and identifying sector-specific workforce development opportunities. This work supports a comprehensive understanding of the workforce needs associated with New Jersey's climate goals, specifically the sectors and measures identified by NJDEP, and it ensures that workforce strategies are aligned with ongoing climate-focused programming and investments underway throughout the state.

The Heldrich Center's Workforce Planning Analysis focuses on the following sectors that have been identified by NJDEP for the CCAP:

- ◇ Electricity Generation and Demand sector
- ◇ Transportation sector
- ◇ Residential & Commercial Buildings sector
- ◇ Industrial sector
- ◇ Waste and Agriculture sector
- ◇ Natural Gas T&D sector
- ◇ Halogenated Gases sector (Industrial Processes and Products Use, or IPPU)
- ◇ Natural and Working Lands – Carbon Sequestration sector

Researchers used Lightcast, a labor market analytics platform, to analyze employment trends and demographic characteristics across each sector by industry and occupation from 2014 to 2024, and to review 10-year job projections for selected industries and occupations. It is important to note that while projections data provides useful guidance, it may not fully capture the realities of the labor market nor align with other data sources. Forecast models, such as the one used in this analysis, rely on historical patterns and assumptions, meaning they cannot account for unforeseen economic shifts, technological advances, policy changes, priorities, and investments that could significantly alter workforce needs over a ten-year horizon.

This report adopts the definition of the "green economy" used by the NJ Council on the Green Economy's *Green Jobs for a Sustainable Future* report (2022), which emphasizes employment tied to environmental infrastructure and energy efficiency. In the context of this workforce planning analysis, the green economy is understood through the lens of the eight sectors identified by NJDEP (see the list above).

Based on the analysis of Green Economy industries, several key workforce characteristics emerge from the data. About half of the sectors have experienced employment growth over the past decade, although this trend is not consistent across all sectors. These industries are predominantly male, with men comprising between 53% and 91% of the workforce. Age distributions are relatively consistent across the sectors. Nonetheless, some industries, such as the Halogenated Gases sector (IPPU) and Natural and Working Lands – Carbon Sequestration sector, have notably older workforces. Racial and ethnic diversity remains limited, with White workers representing the majority in nearly all sectors, followed by Hispanic or Latino¹ and Black or African American workers. Looking ahead to 2034, employment in the Transportation sector, Industrial sector, Natural and Working Lands - Carbon Sequestration sector, and Waste and Agriculture sector is projected to continue growing, albeit some at modest rates. Importantly, the expected declines in the Halogenated Gases sector, Residential & Commercial Buildings sector, and Natural Gas Transmission and Distribution (T&D) sector are, in general, relatively minor. The Electricity Generation and Demand sector shows a larger decrease. All findings should be interpreted with caution given the assumptions made when generating the estimations.

Between 2014 and 2024, workforce trends across Green Economy occupations showed notable variation, with half of the eight sectors maintaining a small and stable employment level and the other half—specifically the Electricity Generation and Demand sector, Transportation sector, and Residential & Commercial Buildings sector—experiencing employment growth, while the Waste and Agriculture sector saw a slight decline. These patterns were mirrored in wage differences, with the Natural and Working Lands - Carbon Sequestration sector having the lowest median annual earnings and the Residential & Commercial Buildings sector the highest for the most part of the decade. Despite some apparent mismatches between earnings and employment trends, the data do not provide enough evidence to confirm labor shortages or surpluses. Demographically, most occupations are male-dominated and concentrated among workers aged 25 to 54 years old. Racial and ethnic diversity remains limited across occupations within these CCAP sectors, although the Halogenated Gases sector (IPPU) has the highest share of Asian workers (14%). Looking ahead, most of the sectors are projected to grow between 2024 and 2034.

In order to assess the State's workforce capacity for the eight sectors in the CCAP, researchers developed an [inventory](#) of education and training programs. The inventory identified 7437 education and training programs that offer certificate or degree opportunities in New Jersey for occupations associated with the eight sectors. The majority of education and training programs in New Jersey are concentrated in the Natural Gas T&D sector, which accounts for 27% of all programs. This concentration is followed by the Industrial sector (nearly 23%) and the Residential & Commercial Buildings sector (19%). Researchers also included NJDEP's [Overburdened Community \(OBC\) data](#) in the inventory of education and training programs to further examine access to education and training from the lens of underserved populations in the state. Several trends emerged from researchers' examination of the relationship between the number of programs and the demographic indicators from the OBC data. Counties with a higher number of education and training programs, such as Middlesex, Mercer, Essex, and Bergen, tend to show higher percentages of minority populations (as in Essex), lower percentages of low-income individuals (as seen in Bergen and Middlesex), and generally lower rates of limited English proficiency, with the exception of Passaic and Hudson. In contrast, counties in the southern region of New Jersey, which have the fewest programs, are characterized by higher proportions of low-income residents and the lowest levels of limited English proficiency.

¹ The label “Hispanic or Latino” comes from the data source used in this analysis. Lightcast, the data provider, categorizes individuals under a single race or ethnic identifier, including “Hispanic or Latino” as a distinct category. Therefore, other racial categories (e.g., White, Black or African American, Asian) implicitly refer to non-Hispanic or Latino individuals. For consistency in terminology and accurate representation of the source, researchers at the Heldrich Center adopt the same labeling conventions. More information from the source can be found here: <https://docs.lightcast.dev/data-sets/us-occupation-by-race-and-ethnicity>.

Researchers also examined New Jersey's current Green Economy landscape, reviewing the ongoing programming and investments spearheaded by the Office of the Governor, NJDEP, the New Jersey Economic Development Authority (NJEDA), and the New Jersey Department of Labor and Workforce Development (NJDOL).

Through the research, the Heldrich Center identified seven common barriers that OBC populations may experience in accessing job opportunities, with a particular focus on employment in the Green Economy. These barriers are listed below:

- ◇ Limited access to education systems that provide affordable career and vocational-technical education and training opportunities.
- ◇ Limited awareness of available career pathways, including the skills, education, and training required to access high-quality, good jobs.
- ◇ Limited awareness of public programs, services, and resources that support career development and skills training.
- ◇ Limited awareness of public programs, services, and resources that provide wraparound services, addressing childcare and family issues, crime and substance abuse, housing instability, disabilities and mental and physical health, and other needs.
- ◇ Inadequate policies, frameworks, and incentives to promote diverse and inclusive hiring practices.
- ◇ Limited availability of high-quality, good jobs.
- ◇ Limited access to reliable, affordable personal or public transportation.

Addressing these multifaceted barriers will require deliberate and strategic investment, ensuring that future resources, programming, and supports are intentionally allocated with an equity-centered lens as well as informed by a meaningful understanding of the nature of these systemic barriers in OBCs. For this reason, targeted workforce development strategies and investments are needed to systemically address these barriers in OBCs throughout the State of New Jersey to foster long-term, sustainable change.

The Heldrich Center proposes the following workforce development strategies tailored to each of the CCAP sectors, as seen in Table 1. NJDEP, as well as other relevant stakeholders in the state, can consider these workforce development strategies as possible avenues by which to foster greater targeted investment and alignment in workforce, education, employer, and sector needs in the Green Economy.

Table 1. Workforce Development Strategies for CCAP Sectors

1: Electricity Generation and Demand sector

Workforce Development Strategy: To support New Jersey's offshore wind, solar, and nuclear energy generation plans, as well as increase utilization of battery storage, there is a need to strengthen career awareness in secondary and post-secondary education institutions for career pathways in this sector.

Strategy Summary: NJDEP, working in coordination with relevant stakeholders, could integrate clean energy curricula, specifically solar, nuclear, and offshore wind concepts and battery storage design, utilization, and installation, into secondary and post-secondary institutions, including technical schools, community colleges, and union apprenticeship programs. NJDEP might also consider how to build upon models of engagement and investments already underway in New Jersey, including NJEDA's [Wind Institute for Innovation and Training](#) and the New Jersey Council of County Colleges' [NJ Pathways project](#). To further complement the expansion and integration of clean energy curricula in secondary and post-secondary institutions, relevant stakeholders could also regularly examine labor market data for key industry segments of the Electricity Generation and Demand sector.

2: Transportation sector

Workforce Development Strategy: *Expand and standardize formal education and certification pathways for specialized workforce training programs for electric vehicles (EV) charging infrastructure with New Jersey's Community Colleges and Technical Schools.*

Strategy Summary: New Jersey State agencies are supporting the expansion and incentivizing the purchase of electric vehicles for both personal and commercial usage. Research suggests that the growing EV industry will require a diversity of workers engaged in scientific research to improve the EV technology over time, refine the technologies' design and development, and progress EV battery manufacturing, as well as a need for workers engaged in EV maintenance and repair, and charging infrastructure development (Shrestha et.al, 2025). In considering this diversity of roles, there is a need to expand and standardize formal education and training pathways for high-quality jobs in the EV sector, which will necessitate that community colleges and technical schools play a central role in preparing students for job opportunities deploying emerging technologies in this industry.

3: Residential & Commercial Buildings sector

Workforce Development Strategy: *Support and enhance workforce development infrastructure to meet the growing demand for electrifying residential and commercial buildings.*

Strategy Summary: Since research suggests that there are workforce challenges that may hinder workforce growth in this sector, NJDEP, in conjunction with other stakeholders, could consider advancing locally driven career awareness strategies while also strengthening connections between employers and educational institutions to align opportunities to develop new talent and reskill the existing workforce. Strengthening partnerships to foster collaboration between employers and educational institutions, specifically community colleges, technical schools, and the K-12 system, could support building both a more responsive and inclusive workforce development infrastructure for energy efficiency jobs and the Residential & Commercial Building sector overall.

4: Industry sector

Workforce Development Strategy: *Promote and expand certification and upskilling opportunities for the existing workforce to attain the skills needed to operate and maintain energy-efficient technologies in manufacturing.*

Strategy Summary: A priority for NJDEP within the Industrial sector is adopting manufacturing equipment efficiency standards and offering incentives for the use of energy-efficient technologies in manufacturing. A corresponding workforce development strategy could focus on upskilling the existing workforce through education and training opportunities that specifically focus on energy-efficient manufacturing. As seen in the [inventory](#) of education and training programs, the Industrial sector accounts for 23.4% of education and training programs, affording ample opportunity for refined and tailored curricula that entice the current

workforce to seek upskilling and reskilling opportunities to ensure that their skills are competitive and match employers' needs in the future. Engagement with the State's vocational and technical schools and county colleges would support the alignment of curricula to reflect the emergence of new technologies.

5: Waste and Agriculture sector

Workforce Development Strategy: *Create a multipurpose awareness and education campaign designed to both promote regulatory compliance and increase awareness of career opportunities.*

Strategy Summary: The CCAP strategy for the sector includes a focus on an education campaign to foster efforts to both improve compliance and generate career awareness. An awareness and education campaign could aim to build understanding of green job opportunities, skill requirements, and workforce pipelines. Data from the Bureau of Labor Statistics highlights that specific job opportunities within this sector include, but are not limited to, Refuse and Recyclable Material Collectors, Plant and System Operators, Hazardous Materials Removal Workers, and Operating Engineers & Other Equipment Operators. New Jersey offers a notable concentration of formal education and training programs in this sector, particularly in Mercer, Middlesex, Essex, and Hudson Counties, while there are very few programs in Cape May, Salem, and Hunterdon Counties. A locally driven awareness and education campaign could help promote targeted community outreach, refine messaging, and highlight accessible career on ramps and pathways into the sector.

6: Natural Gas T&D sector

Workforce Development Strategy: *Develop targeted programming that leverages local community networks to promote career pathways while also instituting mechanisms for the provision of supportive services designed to reduce barriers to education and employment access.*

Strategy Summary: The CCAP strategy for Natural Gas T&D Sector focuses on an expansion of regulation to monitor natural gas emissions and introduction of alternatives to traditional infrastructure developments, which highlight the growing need for a trained and skilled workforce able to support advancements in monitoring technologies and infrastructure development and/or construction practices within the sector. The labor market assessment of this sector revealed that a majority of the workforce is male, White, and above the age of 45, which suggests a need to diversify the pipeline of workers entering the sector, with particular regard to creating and promoting opportunities for youth to engage in this sector as a significant portion of the current workforce approaches retirement. For this reason, NJDEP and other stakeholders could consider advancing locally driven career awareness and engagement strategies in OBCs and diverse communities throughout the state, as well as offering supportive and wraparound services to reduce possible barriers to entry for education and employment in this sector.

7: Halogenated Gases sector (Industrial Processes and Products Use, IPPU)

Workforce Development Strategy: *Work with employers and education providers to transition workforce training programs to support new technologies, such as low-global warming potential (GWP) refrigerant products.*

Strategy Summary: The CCAP strategy for the Halogenated Gases sector (IPPU) includes implementing two programs - a refrigerant management program and a refrigerant replacement incentive program. With these new initiatives, there will also be a need for a trained and skilled workforce to support the maintenance and repair of these new technologies. Developing and updating education and training programs to be aligned with emerging technologies, specifically the manufacturing, installation, maintenance, and repair of low-GWP refrigerant and HVAC technologies, could be an area for critical future investment to ensure that the workforce is equipped with the relevant skills and competencies required to meet the evolving industry demands. As education and training materials are updated to incorporate emerging technologies and other

advancements, NJDEP and other stakeholders could consider the ways in which to involve employers in this development process, working in collaboration with relevant educational institutions and training providers, and fostering and/or incentivizing the creation of employer networks in the service of engagement with education institutions and training providers.

8: Natural and Working Lands – Carbon Sequestration sector

Workforce Development Strategy: Partner with relevant stakeholders to design and launch a federally registered apprenticeship program.

Strategy Summary: NJDEP, working in coordination with other relevant stakeholders, could consider the development of a federally registered apprenticeship program. A federally registered apprenticeship program offers an accessible on-ramp into employment in the Green Economy, as the apprenticeship model often includes lower barriers to entry, thereby making it particularly accessible for individuals in OBCs. NJDEP, working in partnership with the NJDOL, relevant training providers, and potentially the New Jersey Future Farmers of America (FFA), could collaboratively design and implement a federally registered apprenticeship program. The creation of a federally registered apprenticeship program would also allow for engagement with the state's public workforce development system, specifically through the Workforce Innovation and Opportunity Act (WIOA).

The Heldrich Center's CCAP Workforce Planning Analysis report provides an analysis of industry and occupational trends for the eight sectors in the CCAP. It cultivates a skilled, inclusive, and resilient workforce capable of supporting the State's transition to a greener economy. By examining workforce dynamics in key sectors and existing education and training infrastructure in the state, researchers offer evidence-based recommendations for identifying workforce gaps, fostering greater alignment in training programs, and promoting equitable access to economic opportunities, particularly for individuals in overburdened communities. This analysis ensures that New Jersey's investments in pursuit of its climate goals are strategically aligned with the development of a skilled workforce, promotion of economic growth, and the advancement of social equity.

Introduction

Rutgers, the State University of New Jersey, is assisting the New Jersey Department of Environmental Protection (NJDEP) on the development of the State's Comprehensive Climate Action Plan (CCAP). The CCAP will be submitted to the United States Environmental Protection Agency (USEPA) as part of the State's Climate Pollution Reduction Grant (CPRG). New Jersey's Comprehensive Climate Action Plan (CCAP) presents a coordinated strategy to reduce greenhouse gas (GHG) emissions with a particular focus on supporting overburdened communities. As further described by NJDEP, "The CCAP will be an all-encompassing strategy outlining a holistic framework for how the State will reduce greenhouse gas emissions across all sectors to achieve its 2050 goal of an 80 percent reduction."² The CCAP will also serve as an update and refinement to NJDEP's [Global Warming Response Act 80x50 Report](#). The John J. Heldrich Center for Workforce Development has been contracted by the Climate Change Resource Center (CCRC) at Rutgers University to conduct a Workforce Planning Analysis for inclusion in the CCAP.

The Heldrich Center for Workforce Development is a nationally recognized research and policy organization dedicated to improving workforce programs, informing labor market policy, and advancing education-to-employment pathways. Through independent research, program evaluation, and technical assistance, the Center works to strengthen workforce systems, support job seekers, and help employers meet their talent needs. The Heldrich Center's expertise in labor market dynamics and workforce development strategies has been integral to informing the Workforce Planning Analysis for New Jersey's CCAP.

The Workforce Planning Analysis serves as a critical component of the CCAP, offering guidance and targeted recommendations for workforce development strategies and interventions in alignment with New Jersey's priority climate investments. The Heldrich Center was tasked with preparing a Workforce Planning Analysis to evaluate the measures across NJDEP's eight sectors - Electricity Generation and Demand sector, Transportation sector, Residential & Commercial Buildings sector, Industrial sector, Waste and Agriculture sector, Natural Gas T&D sector, Halogenated Gases sector (IPPU), and Natural and Working Lands - Carbon Sequestration sector. The Heldrich Center has applied a four-pronged analysis to the CCAP's Workforce Planning Analysis. The four analyses include:

- ◇ Examining the labor market of the Green Economy in New Jersey
- ◇ Updating and assessing the Heldrich Center's inventory of education and training programs related to NJDEP's eight sectors
- ◇ Identifying barriers that overburdened communities may experience in accessing education and employment opportunities in the Green Economy
- ◇ Identifying opportunities for sector-specific workforce development strategies

Through this methodological approach, the Heldrich Center offers a comprehensive Workforce Planning Analysis for inclusion in NJDEP's CCAP. Additionally, the Workforce Planning Analysis has been developed in relation to the USEPA [guidance](#) and [resources](#) for the CCAP under the CPRG program, as well as the U.S. Department of Labor's [Good Job Principles](#). Taken together, these analyses aim to understand the workforce and labor market implications of New Jersey's sectors for the CCAP and to systematically address the growing workforce impacts of climate change and climate mitigation efforts across the state.

Methodology

² <https://dep.nj.gov/climatechange/mitigation/cprg/>

This section outlines the Heldrich Center's methodological approach to developing the Workforce Planning Analysis for inclusion in the CCAP. The Heldrich Center approached these four analyses using a variety of methodologies.

Labor Market Assessment

The Heldrich Center conducted the labor market assessment to better understand the Green Economy in New Jersey. In defining the Green Economy, researchers specifically examined NJDEP's eight sectors - Electricity Generation and Demand sector, Transportation sector, Residential & Commercial Buildings sector, Industrial sector, Waste and Agriculture sector, Natural Gas T&D sector, Halogenated Gases sector (IPPU), and Natural and Working Lands - Carbon Sequestration sector. Researchers leveraged Lightcast³ to examine key labor market information, including the number of individuals employed in each sector and their demographic characteristics between 2014 and 2024, by industry and occupation. Researchers also used Lightcast to provide 10-year job projections for specific industries and occupations. The information from the labor market scan includes workers from the Quarterly Census of Employment and Wages (QCEW)⁴, which is generated by the Bureau of Labor Statistics and adjusted by Lightcast.⁵ The research team notes that although projections data for 2024–2034 offer valuable insights to a labor market assessment, it may not fully reflect actual labor market dynamics or align with other data sources. Labor market projections and forecast models are built on historical patterns and assumptions, and therefore cannot anticipate unexpected economic disruptions, technological innovations, policy changes, shifting priorities, or new investments that could substantially reshape workforce needs over a ten-year period.

Training Inventory

To assess the state's workforce capacity for each of the CCAP sectors, researchers developed an [inventory](#) of education and training programs. As part of the Heldrich Center's previous work with NJDEP, in 2024, researchers constructed an inventory of education and training programs for the Priority Climate Action Plan (PCAP). In 2025, for the CCAP, the Heldrich Center reconstructed and refined the education and training programs inventory to reflect new training programs, align with NJDEP's eight CCAP sectors, and make it public-facing and accessible to relevant stakeholders. Researchers used Standard Occupational Classification (SOC)⁶ codes to identify occupations associated with each of the sectors and matched each SOC code with its corresponding Classification of Instructional Programs (CIP)⁷ code. Using the SOC-CIP crosswalk, researchers collected educational information from various data sources, including the Integrated Postsecondary Education Data System (IPEDS)⁸ and the Career and Technical Education (CTE).⁹ Researchers used these data sources to construct the [inventory](#), which has been updated in 2025 to reflect NJDEP's sectors for the CCAP.

The [inventory](#) contains information on eight **sectors** (Natural and Working Lands - Carbon Sequestration sector, Electricity Generation and Demand sector, Halogenated Gases sector (IPPU), Industrial sector, Natural Gas T&D sector, Residential & Commercial Buildings sector, Transportation sector, and Waste

³ Lightcast is an analytical tool with labor market information from various data sources, including QCEW, the American Community Survey, and more. Users can generate reports on data by occupations, programs, job postings, industries, and regions. For more detailed information, please visit the Lightcast knowledge base: <https://kb.lightcast.io/en/>

⁴ https://kb.lightcast.io/en/articles/6957498-lightcast-data-basic-overview#h_f56529c326

⁵ <https://www.bls.gov/cew/overview.htm>

⁶ <https://www.bls.gov/soc/>

⁷ <https://nces.ed.gov/ipeds/cipcode/Default.aspx?y=56>

⁸ <https://nces.ed.gov/ipeds/about-ipeds>

⁹ <https://www.nj.gov/education/cte/>

and Agriculture sector), **institution/organization name**, **occupation**¹⁰, **career cluster** (based on two-digit Classification of Instructional Program (CIP) codes), program **type** (certification or degree-seeking), **award level** (associate degree, bachelor degree, certifications of at least 1 but less than 2 years, certifications of at least 12 weeks but less than 1 year, certifications of at least 2 years but less than 4 years, certifications of less than 12 weeks, doctorate, master's degree, and postbaccalaureate certification), and **county**. The Heldrich Center has created two maps (Figures 11 and 12) for this report that display the number of programs and the number of distinct providers that offer them by county.

The [inventory](#) also includes maps of county demographic information, generated using information from Overburdened Communities (OBC)¹¹ data from NJDEP, which highlights households with limited English proficiency, low-income populations, and minority populations. This examination of OBC data by county further serves to examine dynamics and barriers that underserved communities may face in accessing related training and job opportunities in the Green Economy, as it pertains to the eight sectors outlined by NJDEP.

Barriers for Underserved Communities in New Jersey

The identification of barriers that underserved communities and/or OBCs may face when accessing education and employment opportunities in the Green Economy was compiled referencing relevant research and utilizing the Heldrich Center's expertise in the field. This section also builds upon previous research that the Heldrich Center completed for NJDEP's submission of the PCAP in 2024.

Workforce Development Strategies

The Heldrich Center examined relevant literature and research on sector-specific workforce development strategies and existing New Jersey investments in green jobs and the Green Economy to inform the workforce development strategies. The Heldrich Center also relied on institutional knowledge and subject matter expertise regarding workforce dynamics and sector-based workforce development strategies. Specific relevant literature referenced in the Workforce Planning Analysis of the CCAP includes, but is not limited to:

- ◇ The 2022 Council on the Green Economy Report, [Green Jobs for a Sustainable Future](#)
- ◇ The New Jersey Governor's Office of Climate Action and the Green Economy Report, [Growing Green Jobs: The Opportunities for New Jersey's Workforce](#)
- ◇ [The 2019 New Jersey Energy Master Plan Pathway to 2050](#)
- ◇ Available materials for New Jersey's 2024 Energy Master Plan (draft, unreleased)
- ◇ [The Regional Greenhouse Gas Initiative \(RGGI\) Strategic Funding Plan](#)
- ◇ [The Global Warming Response Act \(GWRA\) 80×50 Report](#)
- ◇ [A Strategy to Advance Carbon Sequestration on New Jersey's Natural and Working Lands Report](#)

These reports offered researchers foundational guidance by which to generate sector-specific workforce development strategies. In this way, the Heldrich Center's analysis seeks to complement and build upon existing infrastructure, investments, priorities, and programming in green jobs and the Green Economy in the State of New Jersey.

Taken together, these four analyses offer insight into New Jersey's workforce development landscape as it relates to the sectors identified by NJDEP for inclusion in the CCAP.

¹⁰ <https://www.onetcenter.org/overview.html>

¹¹ <https://dep.nj.gov/ej/communities/>

Considerations for the Analysis

This analysis comprises four major components, two of which have distinct considerations and limitations that must be acknowledged. First, one key limitation lies in the way the Green Economy is assessed, specifically in how industries and occupations are assigned to each of the eight sectors. These areas cover a broad spectrum of industries and occupations, which makes it essential to define more precise boundaries for analysis. To do this, researchers used the North American Industry Classification System (NAICS)¹² to identify relevant industries and the Standard Occupational Classification (SOC) system to link associated occupations, as well as reviewing the information from the generated [inventory](#). These NAICS and SOC selections were developed in collaboration with NJDEP. In most cases, multiple representative NAICS industries or SOC occupations were selected to approximate each sector. The resulting workforce metrics reflect weighted averages across these selections. A few exceptions rely on a single industry or occupation (see Tables 3 and 4). While this approach enables practical analysis, it necessarily simplifies the complex realities of each sector and may not fully reflect the diversity within each sector. A second limitation of the analysis relates to the development of the education and training inventory, specifically the restricted access to several of the data sources previously used to compile it. The version submitted for inclusion in the PCAP in 2024 drew from a broad range of sources, including IPEDS, the Consumer Report Card (CRC), CTE programs, utilities, unions, and other training providers. However, the CRC is no longer available, and some sources were deemed out of scope and/or not feasible for the present update. As a result, this revised version focuses on a narrower but more detailed inventory, relying primarily on IPEDS and CTE data. While this may skew the coverage toward more formal education and training programs, the included programs are more clearly aligned with the scope and structure of the eight sectors.

NJDEP CCAP Sectors and Measures

The following sectors have been identified by NJDEP for the CCAP.

- ◇ Electricity Generation and Demand sector
- ◇ Transportation sector
- ◇ Residential & Commercial Buildings sector
- ◇ Industrial sector
- ◇ Waste and Agriculture sector
- ◇ Natural Gas T&D sector
- ◇ Halogenated Gases sector (IPPU)
- ◇ Natural and Working Lands – Carbon Sequestration sector

As seen in Table 2, NJDEP has further identified a series of measures for each CCAP sector.

Table 2. NJDEP CCAP Sectors & Measures

NJDEP Sector 1: Electricity Generation and Demand sector	
Measure 1	Codify the 100% Clean Electricity Standard
Measure 2	Reduce peak demand through adoption of progressive electricity rate designs and flexible loads

¹² <https://www.census.gov/naics/>

Measure 3	Support the development of 9 GW of distributed solar and 19.6 GW of utility-scale solar by 2050
Measure 4	Continue to participate in RGGI program
Measure 5	Continue to support the development of 11 GW of offshore wind by 2040
Measure 6	Support the development of 2 GW of new nuclear energy generation sources by 2050
Measure 7	Support the deployment of 22 GW of battery storage by 2050
Measure 8	Invest in the development of 7 GW of additional clean firm capacity

NJDEP Sector 2: Transportation sector

Measure 1	Implement a GHG reduction planning standard for state and MPO transportation plans to reduce statewide light-duty vehicle miles travelled (VMT) 3% by 2050
Measure 2	Implement large-scale public transit projects to reduce statewide light-duty VMT
Measure 3	Explore new pricing mechanisms and alternative sustained funding sources for transit and other transportation alternatives that reduce VMT and emissions
Measure 4	Continue to implement all current policies and expand current transportation electrification programs

NJDEP Sector 3: Residential & Commercial Buildings sector

Measure 1	Accelerate heat pump installations
Measure 2	Adopt a Clean Heat Standard
Measure 3	Upgrade building envelopes
Measure 4	Establish all-electric building codes
Measure 5	Adopt statewide Building Performance Standards
Measure 6	Adopt Zero Emissions Standards for space and water heating
Measure 7	Lead by example by decarbonizing State, county and municipal resources

NJDEP Sector 4: Industrial sector

Measure 1	Adopt manufacturing equipment efficiency standards and incentives for energy efficient technologies in manufacturing
Measure 2	Implement a mandatory emissions reduction program for high-emitting sources in the Industrial sector

NJDEP Sector 5: Waste and Agriculture sector

Measure 1	Adopt stricter rules for landfill caps and lower threshold for emission reporting and controls at landfills and wastewater treatment facilities
Measure 2	Expand regulatory requirements for food waste recycling and diversion
Measure 3	Apply compost to cropland and pasture

NJDEP Sector 6: Natural Gas T&D sector

Measure 1	Implement a mandatory emissions reduction program for natural gas T&D systems
Measure 2	Stop the expansion of natural gas T&D infrastructure and introduce non-pipeline alternatives

NJDEP Sector 7: Halogenated Gases sector (IPPU)

Measure 1	Implement a refrigerant management program
Measure 2	Implement a refrigerant replacement incentive program

NJDEP Sector 8: Natural and Working Lands - Carbon Sequestration sector

Measure 1	Maintain, restore, and expand existing natural carbon sinks to 9.2 MMT CO ₂ e/year
Measure 2	Expand high-carbon land acquisition for state and local parks

These CCAP sectors and measures offer a comprehensive path forward for New Jersey's climate investments, which require the support of a skilled and trained workforce to underpin these varied endeavors across the eight sectors.

Examination of the State's Workforce Capacity in the CCAP Sectors

The following section highlights the Heldrich Center's analysis of the State's workforce capacity in NJDEP's eight CCAP sectors by examining the Green Economy labor market and availability of relevant education and training programs across the state. This section also includes an examination of relevant ongoing climate investments in New Jersey, as led by the Office of the Governor, the New Jersey Department of Environmental Protection (NJDEP), the New Jersey Economic Development Authority (NJEDA), and the New Jersey Department of Labor and Workforce Development (NJDOL), to offer greater context to the State's workforce capacity in the sectors for the CCAP.

Green Economy Landscape

The following subsection discusses the workforce landscape for the Green Economy, specifically the eight CCAP sectors, in New Jersey. It highlights the key industries and occupations associated with each sector and analyzes workforce trends between 2014 and 2024. The analysis also looks at the workforce demographics to understand who is employed in each sector and how this has changed over time. To better capture the complexity of the Green Economy, both industries and occupations are considered. Industries point to the broader economic areas tied to each sector, while occupations highlight specific job roles. Examining both industries and occupations offers a more comprehensive picture of how the labor force is structured and identifies considerations for the workforce in the coming years.

Industries from the Green Economy

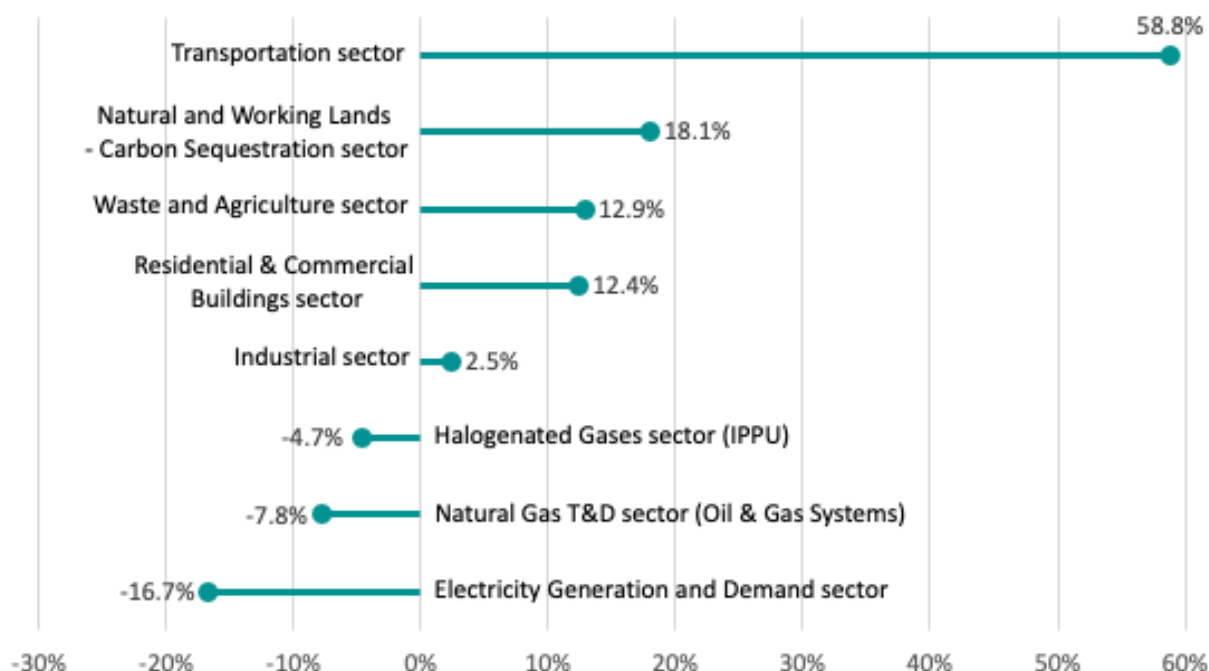
To analyze industries within each of the eight sectors, researchers selected at least one representative industry per area, as detailed in Table 3. These selections were informed by the sectors and measures discussed in the previous section, consultations with NJDEP, and the availability of data from Lightcast.

For sectors with more than one representative industry, the results presented correspond to a weighted average of all industries included in that area.

Table 3. Mapping Sectors to Industries

Sector	NAICS	Industry Description
Electricity Generation and Demand sector	22111	Electric Power Generation
	211114	Solar Electric Power Generation
	335910	Battery Manufacturing
Transportation sector	48	Transportation and Warehousing
Residential & Commercial Buildings sector	236220	Commercial and Institutional Building Construction
	236115	New Single-Family Housing Construction (except For-Sale Builders)
Industrial sector	325	Chemical Manufacturing
	324110	Petroleum Refineries
Waste and Agriculture sector	562	Waste Management and Remediation Services
Natural Gas T&D sector	486210	Pipeline Transportation of Natural Gas
	211130	Natural Gas Extraction
Halogenated Gases sector (IPPU)	325120	Industrial Gas Manufacturing
	445110	Supermarkets and Other Grocery (except Convenience) Stores
Natural and Working Lands – Carbon Sequestration sector	11	Agriculture, Forestry, Fishing and Hunting
	561730	Landscaping Services

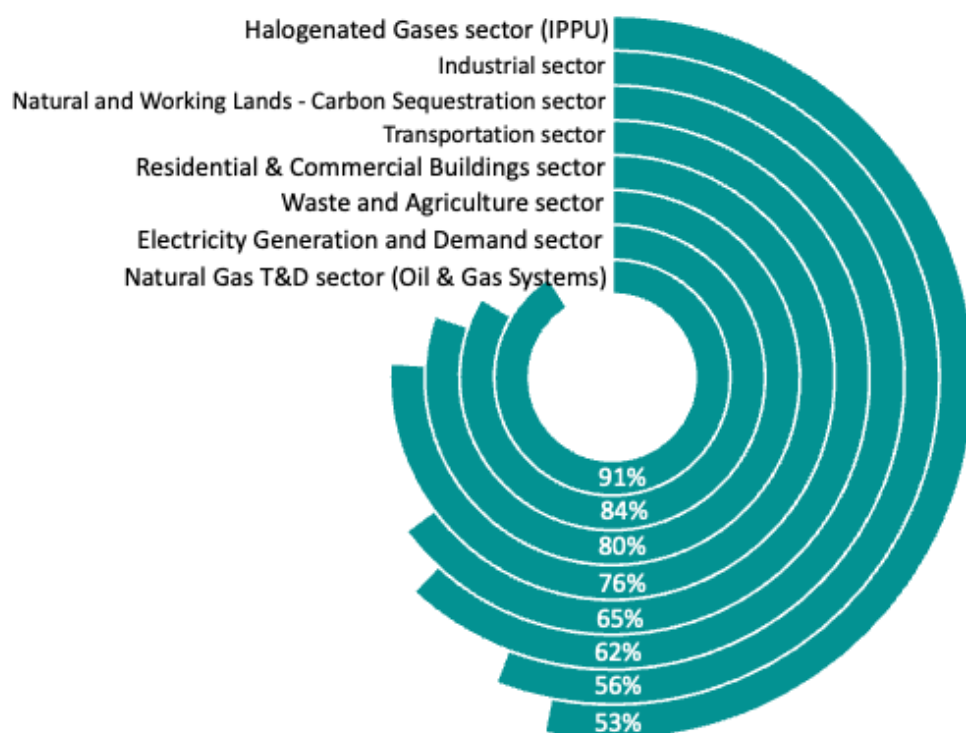
Figure 1. Percentage Change in Workforce by Sector, 2014–2024



Note: The employment figures for the “Electricity Generation and Demand sector,” “Residential & Commercial Buildings sector,” “Industrial sector,” “Natural Gas T&D sector,” “Halogenated Gases sector (IPPU),” and “Natural and Working Lands - Carbon Sequestration sector” are calculated as weighted averages of the industries representing each sector.

Figure 1 illustrates the percentage change in the number of jobs across each sector between 2014 and 2024. The results show significant growth in one sector: the Transportation sector (58.8%). It also presents a more moderate increase in the Natural and Working Lands - Carbon Sequestration sector (18.1%), Waste and Agriculture sector (12.9%), Residential & Commercial Buildings sector (12.4%), and Industrial sector (2.5%). In contrast, employment declined in three sectors: the Halogenated Gases sector (IPPU) (-4.7%), Natural Gas T&D sector (-7.8%), and Electricity Generation and Demand sector (-16.7%). Overall, while industries tied to infrastructure and land-based activities have expanded considerably, those associated with process-based operations have experienced declines over the past decade. Nevertheless, it is important to note that the results reflect a simplified view of the potential effects within each sector, shaped by the specific industries selected to represent them.

Figure 2. Proportion of Male Workers by CCAP Sector, 2024

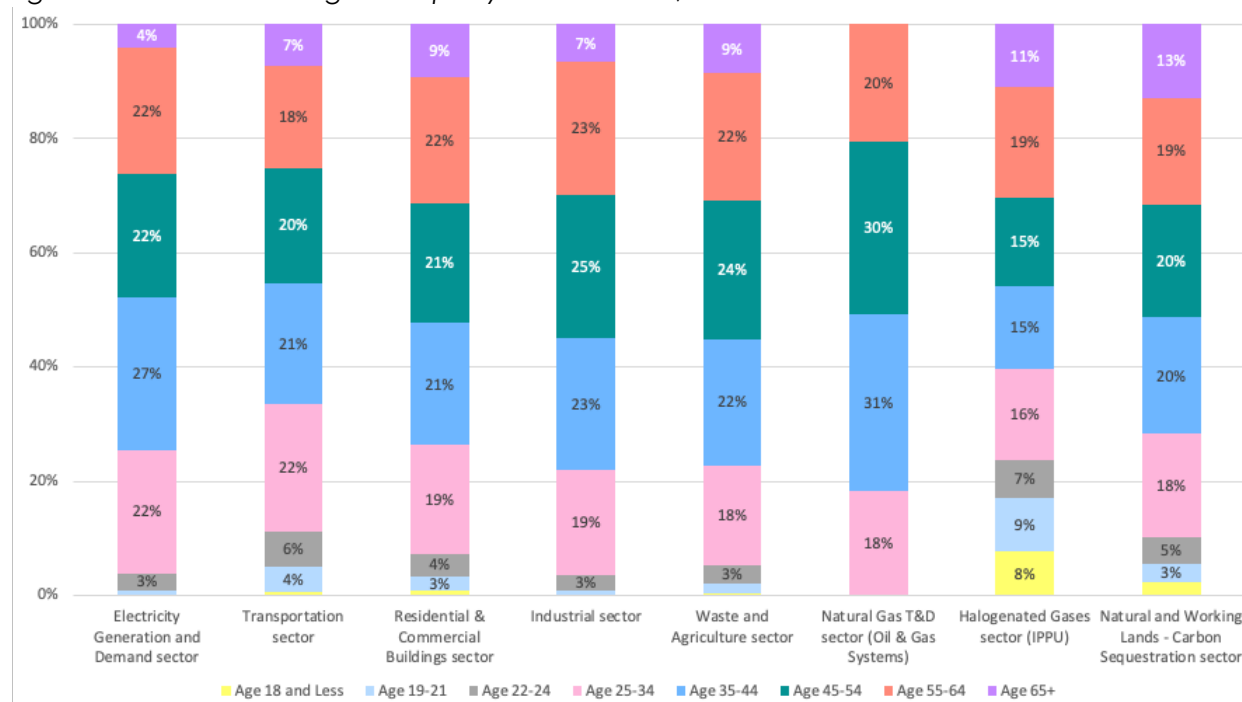


Note: The results for the “Electricity Generation and Demand sector,” “Residential & Commercial Buildings sector,” “Industrial sector,” “Natural Gas T&D sector,” “Halogenated Gases sector (IPPU),” and “Natural and Working Lands - Carbon Sequestration sector” are calculated as weighted averages of the industries representing each sector. The values have been rounded for simplicity and to avoid displaying decimals.

Figure 2 displays the gender composition of the workforce across each of the eight sectors.¹³ The data indicate that all the sectors are predominantly male, with men representing more than half of the workforce in every sector. Four sectors stand out for having particularly high male representation, with more than three-quarters of their workforce being men. These include the Residential & Commercial Buildings sector (76%), Waste and Agriculture sector (80%), Electricity Generation and Demand sector (84%), and Natural Gas T&D sector with 91%. Conversely, two areas show relatively greater gender balance: the Industrial sector, where 56% of workers are male, and the Halogenated Gases sector (IPPU), where men make up 53% of the workforce.

¹³ Researchers use the term “gender” in this analysis, acknowledging that the available data reports only binary categories —male and female —based on sex.

Figure 3. Distribution of Age Groups by CCAP Sector, 2024



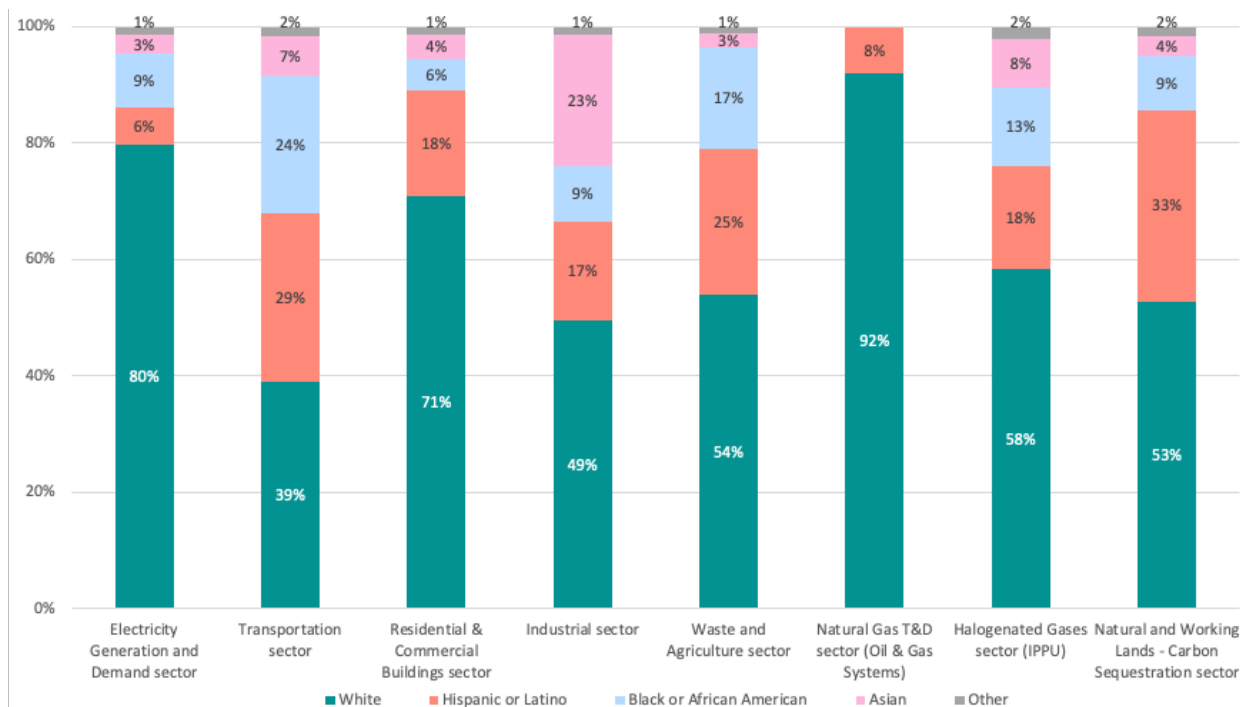
Note: The results for the following sectors are calculated as weighted averages of the industries representing them: “Electricity Generation and Demand sector,” “Residential & Commercial Buildings sector,” “Industrial sector,” “Natural Gas T&D sector,” “Halogenated Gases sector (IPPU),” and “Natural and Working Lands - Carbon Sequestration sector.” Additionally, one specific data point was excluded due to insufficient sample size, which prevents the disclosure of detailed information while preserving confidentiality: individuals aged 65 or older in the “Natural Gas T&D sector.” Note that all values have been rounded to the nearest whole number to enhance readability and avoid decimal precision.

Figure 3 illustrates the age distribution of the workforce across each sector. Overall, all sectors are predominantly composed of individuals aged 25 to 54, which corresponds to the prime age of individuals who are most likely to be in the labor force. The Natural Gas T&D sector has the youngest workforce, with approximately 49% of its workers between the ages of 25 and 44. This result is closely followed by the Electricity Generation and Demand sector (48%) and the Transportation sector (43%) in the same age group.

Regarding the more mature workforce, the Industrial sector and Natural Gas T&D sector reach the highest percentages with 48% and 51% of workers, respectively, falling between the ages of 45 and 64. The Industrial sector also has a larger proportion of workers aged 55–64 (23%), while the Natural and Working Lands - Carbon Sequestration sector has nearly three times the percentage of workers aged 65 and older compared to the sector with fewer of them (the Electricity Generation and Demand sector), reflecting an aging workforce (13%).

Figure 4 presents the racial/ethnic composition of the workforce across each sector for 2024. In general, there is a consistent pattern that emerges across all sectors: White individuals are employed in these sectors, comprising between 39% and 92% of the workforce. Hispanic or Latino workers make up the second-largest group, ranging from 6% to 33%, followed by Black or African American individuals, who represent between 6% and 24% of workers. While most sectors show limited variation in workforce composition, the Transportation sector stands out as the most racially and ethnically diverse, followed by the Industrial sector.

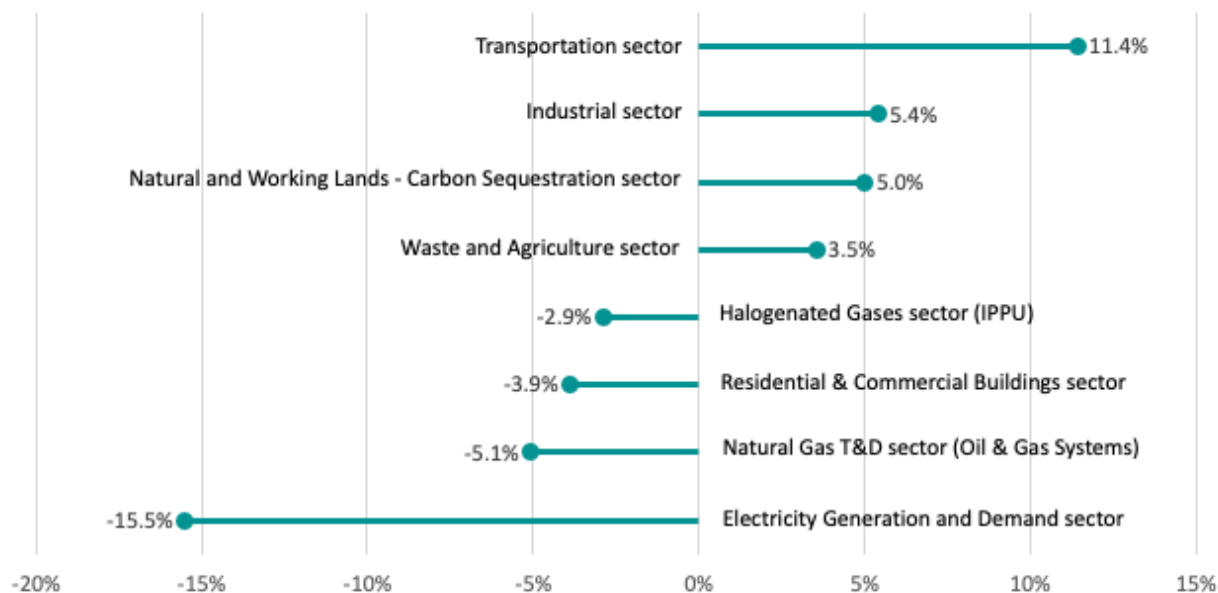
Figure 4. Distribution of Race/Ethnicity Groups by CCAP Sector, 2024



Note: "Other" includes individuals identified as American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, or Two or More Races. These categories have been combined to protect confidentiality due to small sample sizes. Moreover, the results for the "Electricity Generation and Demand sector," "Residential & Commercial Buildings sector," "Industrial sector," "Natural Gas T&D sector," "Halogenated Gases sector (IPPU)," and "Natural and Working Lands - Carbon Sequestration sector" are calculated as weighted averages of the industries representing each sector. Additionally, one specific data point was excluded due to insufficient sample size, which prevents the disclosure of detailed information while preserving confidentiality: Asian individuals in the "Natural Gas T&D sector." As a final note, all values have been rounded for simplicity and to avoid displaying decimal places.

Figure 5 presents projected workforce changes between 2024 and 2034 for the industries representing the eight sectors. Overall, half of all the sectors are expected to experience employment growth over the next decade. The most significant projected increase is in the Transportation sector (11.4%). More modest growth is anticipated in the Industrial sector (5.4%), Natural and Working Lands - Carbon Sequestration sector (5.0%), and Waste and Agriculture sector (3.5%). In contrast, the Halogenated Gases sector (IPPU) (-2.9%), the Residential & Commercial Buildings sector (-3.9%), and the Natural Gas T&D sector (-5.1%) are expected to decline moderately. The Electricity Generation and Demand sector is expected to have a more significant decline (-15.5%). When compared to Figure 1, these projections suggest that the downward trend in employment in the Electricity Generation and Demand sector, observed since 2014, is likely to continue through 2034. Nonetheless, the results should be interpreted with caution, as they are based on representative industries that, while informative, may not fully reflect the heterogeneity within each sector. Researchers also note that projections data have inherent limitations and may at times conflict with other data sources, reflecting differences in methodology, assumptions, and time horizons, among other factors.

Figure 5. Expected Percentage Change in Workforce by CCAP Sector, 2024–2034



Note: The expected percentage change for the “Electricity Generation and Demand sector,” “Residential & Commercial Buildings sector,” “Industrial sector,” “Natural Gas T&D sector,” “Halogenated Gases sector (IPPU),” and “Natural and Working Lands - Carbon Sequestration sector” are calculated as weighted averages of the industries representing each sector.

Based on the analysis of Green Economy industries, several key workforce characteristics emerge. Most sectors have experienced employment growth over the past decade, although this trend is not consistent across all sectors. This is not the case for the Halogenated Gases sector (IPPU), Natural Gas T&D sector, and Electricity Generation and Demand sector. When looking at gender composition, the sectors are predominantly male, with men comprising between 53% and 91% of the workforce. Age distributions are relatively consistent across the sectors. Nonetheless, some industries, such as the Halogenated Gases sector (IPPU) and Natural and Working Lands - Carbon Sequestration sector, have notably older workforces.

The racial and ethnic diversity of these workforces remains limited, with White workers representing the majority in nearly all sectors, followed by Hispanic or Latino and Black or African American workers in a much smaller proportion, except in some sectors, such as the Transportation sector and the Industrial sector. Looking ahead to 2034, half of the sectors are projected to continue growing, albeit some at modest rates. Importantly, the expected declines in the latter sectors are relatively minor, except for the Electricity Generation and Demand sector, which is a finding that should be interpreted with caution given the assumptions made when generating the estimations. To this end, the [Growing Green Jobs](#) report, which utilized a different employment modeling methodology, expects growth in the Electricity Generation and Demand sector.¹⁴

¹⁴ The employment modeling process for the Growing Green Jobs report is detailed on pages 32 and 33. In part, the report states, “Employment impacts for each sector were derived from in-state capital and operational expenditures on electricity and fuel resources, building efficiency and electrification measures, and alternative transportation adoption. To provide a comprehensive look at direct employment outcomes, the modeling framework includes negative impacts to the New Jersey economy in the form of reduced employment in fossil electricity generators and fuel suppliers. This modeling does not include economic impacts to households and businesses from cost recovery or energy savings, which is outside the scope of this analysis.” For a full explanation of the modeling, please reference the report - <https://www.nj.gov/governor/docs/Green-Jobs-Report-9.22.25.pdf>

Occupations in the Green Economy

Regarding occupations, researchers used a similar approach to the one employed for identifying industries in the previous subsection. Researchers began by reviewing the types of jobs and skills commonly associated with each sector, consulting with NJDEP, and then compared this information to available occupational data. This procedure helped ensure that the chosen occupation for each sector reflected both the nature of the work and the skills required, specific to each sector. This procedure was complemented by a review of the education and training inventory to identify occupations that appeared most frequently across programs, using program count as a proxy for relevance and workforce demand. The combination of labor market relevance, training program availability, and alignment with sector-specific needs led to the final list of occupations. The occupations listed in Table 4 represent those that were determined to best meet the workforce demands of each sector.

Table 4. Mapping CCAP Sectors to Occupations

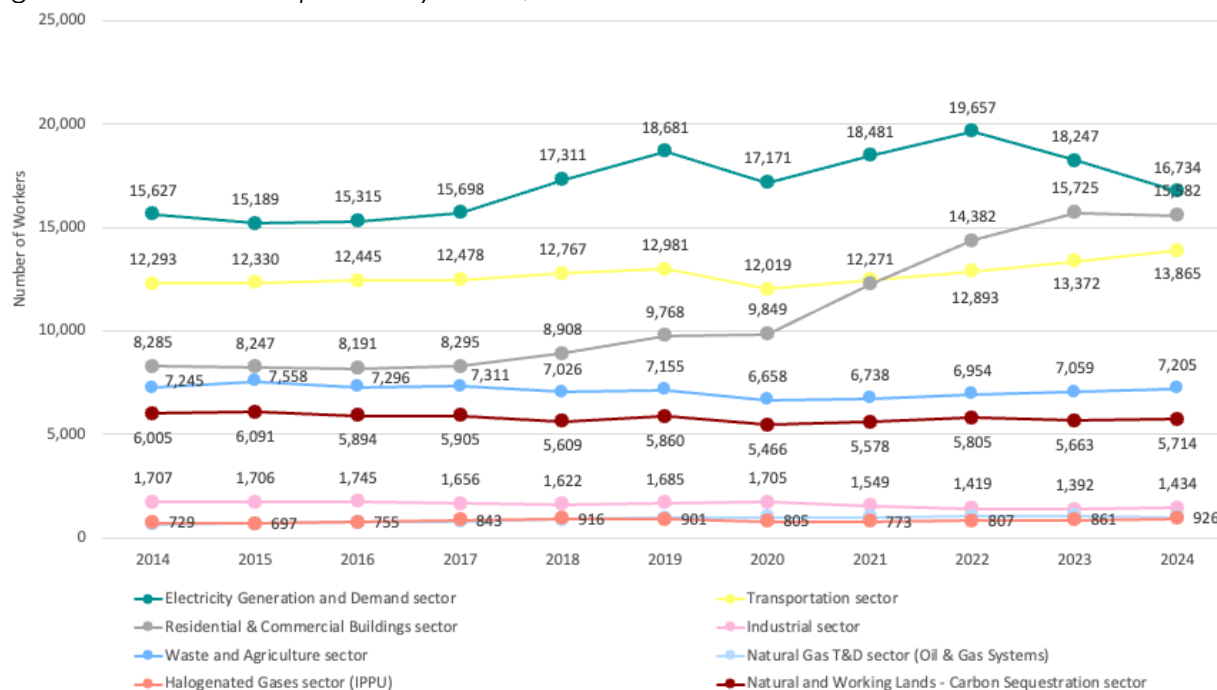
Sector	SOC Codes	Occupation Name
Electricity Generation and Demand sector	49-9051	Electrical Power-Line Installers and Repairers
	47-2231	Solar Photovoltaic Installers
	51-2090	Miscellaneous Assemblers and Fabricators
Transportation sector	49-3031	Bus and Truck Mechanics and Diesel Engine Specialists
	49-3023	Automotive Service Technicians and Mechanics
Residential & Commercial Buildings sector	47-1011	First-Line Supervisors of Construction Trades and Extraction Workers
Industrial sector	51-8090	Miscellaneous Plant and System Operators
Waste and Agriculture sector	45-2090	Miscellaneous Agricultural Workers
	51-8030	Water and Wastewater Treatment Plant and System Operators
Natural Gas T&D sector	49-9012	Control and Valve Installers and Repairers, Except Mechanical Door
Halogenated Gases sector (IPPU)	17-3026	Industrial Engineering Technologists and Technicians
Natural and Working Lands – Carbon Sequestration sector	45-2092	Farmworkers and Laborers, Crop, Nursery, and Greenhouse
	19-1032	Foresters

Figure 6 presents workforce trends from 2014 to 2024 across the eight Green Economy sectors' selected occupations. Four sectors' occupations—Industrial sector, Natural Gas T&D sector, Halogenated Gases sector (IPPU), and Natural and Working Lands - Carbon Sequestration sector—show relatively small and stable workforce sizes over the ten-year period. In contrast, other sectors' occupations exhibit more dynamic patterns.

The Waste and Agriculture sector, represented by the occupations "Miscellaneous Agricultural Workers" and "Water and Wastewater Treatment Plant and System Operators," shows a generally stable workforce with a slight downward trend. In contrast, the Residential & Commercial Buildings

sector experienced steady growth starting in 2018, with a slight decrease in 2024. The Transportation sector occupations have experienced a moderate but consistent growth over the last ten years. Among all sectors, the Electricity Generation and Demand sector selected occupations have maintained the largest workforce over the last decade. Although employment dipped in 2020, it steadily recovered through 2022, followed by a mild decline in 2023 and a more pronounced drop in 2024.

Figure 6. Trends in Occupations by Sector, 2014–2024

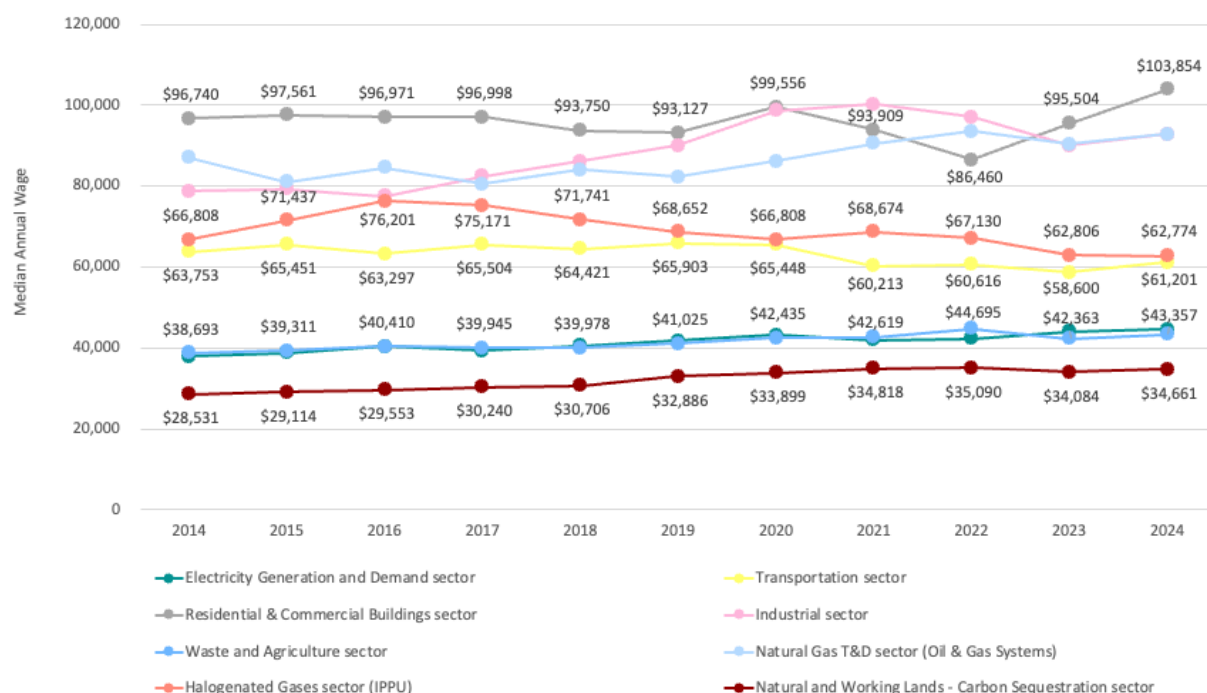


Note: Due to space constraints, the values for “Natural Gas T&D sector,” the light-blue line near the bottom of the graph, have been omitted from the figure. However, the estimated number of workers in the “Natural Gas T&D sector” ranges from 637 to 1,071. Moreover, the occupation figures for the “Electricity Generation and Demand sector,” “Transportation sector,” “Waste and Agriculture sector,” and “Natural and Working Lands - Carbon Sequestration sector” are calculated as weighted averages of the occupations representing each sector.

Figure 7 presents median annual earnings from 2014 to 2024, with all values adjusted to 2024 U.S. dollars using the Consumer Price Index for All Urban Consumers (CPI-U).¹⁵ While significant differences exist across the occupations selected for the eight sectors, it is necessary to note that a single occupation represents half of the sectors. In contrast, others are characterized by a weighted average of multiple occupations chosen to represent the sector, as detailed in Table 3. The lowest median earnings are observed in the occupations for the Natural and Working Lands - Carbon Sequestration sector, the Waste and Agriculture sector, and the Electricity Generation and Demand sector. The Transportation sector and Halogenated Gases sector (IPPU) show similar earnings in the mid-range, with the latter being marginally higher. Higher wages are found in the occupations for the Industrial sector, the Natural Gas T&D sector, with the Residential & Commercial Buildings sector showing the highest median earnings overall.

¹⁵ <https://www.bls.gov/cpi/overview.htm>

Figure 7. Median Annual Wages, 2014-2024 (in 2024 \$USD)



Note: Median annual wages have been adjusted to 2024 U.S. dollars using the Consumer Price Index for All Urban Consumers (CPI-U). Due to space constraints, the values for the “Electricity Generation and Demand sector,” “Industrial sector,” and “Natural Gas T&D sector” sectors are not displayed in the figure. However, the corresponding median wage ranges for these sectors are as follows: \$37,915 to \$44,574 for the Electricity Generation and Demand sector, \$77,447 to \$100,147 for the Industrial sector, and \$80,468 to \$93,483 for the Natural Gas T&D sector. The results for “Electricity Generation and Demand sector,” “Transportation sector,” “Waste and Agriculture sector,” and “Natural and Working Lands - Carbon Sequestration sector” are calculated as weighted averages of the occupations representing each sector. Finally, the values have been rounded to avoid displaying decimals.

Across most sectors, wages have remained relatively stable over the past decade. However, several sectors’ occupations — including the Electricity Generation and Demand sector, the Transportation sector, and the Residential & Commercial Buildings sector—exhibit a decline in earnings around 2021. Interestingly, these declines in earnings coincide with workforce increases in the same period (see Figure 6).

While such patterns could be interpreted as signals of a temporary labor surplus, the fluctuations are brief and inconsistent over time. As such, these trends are noted here only as points of interest, not as definitive evidence of labor market imbalances.¹⁶ Conversely, an opposite pattern is observed in the Electricity Generation and Demand sector since 2022, where earnings increased alongside a shrinking workforce. While this may suggest a potential tightening of labor supply, or even a labor shortage, the data are not robust or sustained enough to draw firm conclusions. In this case, this signal warrants monitoring but should be interpreted with caution, given the limited occupational scope and temporal variability.

As with the industries analyzed, the occupations selected to represent the sectors are predominantly comprised of a male workforce, as shown in Table 5. Across all eight sectors, the share of male workers ranges from 56% to over 98%. The Electricity Generation and Demand sector stands out as having the highest proportion of female workers among the selected occupations. At the opposite end of the

¹⁶ <https://www.bls.gov/opub/mlr/1999/03/art2full.pdf>

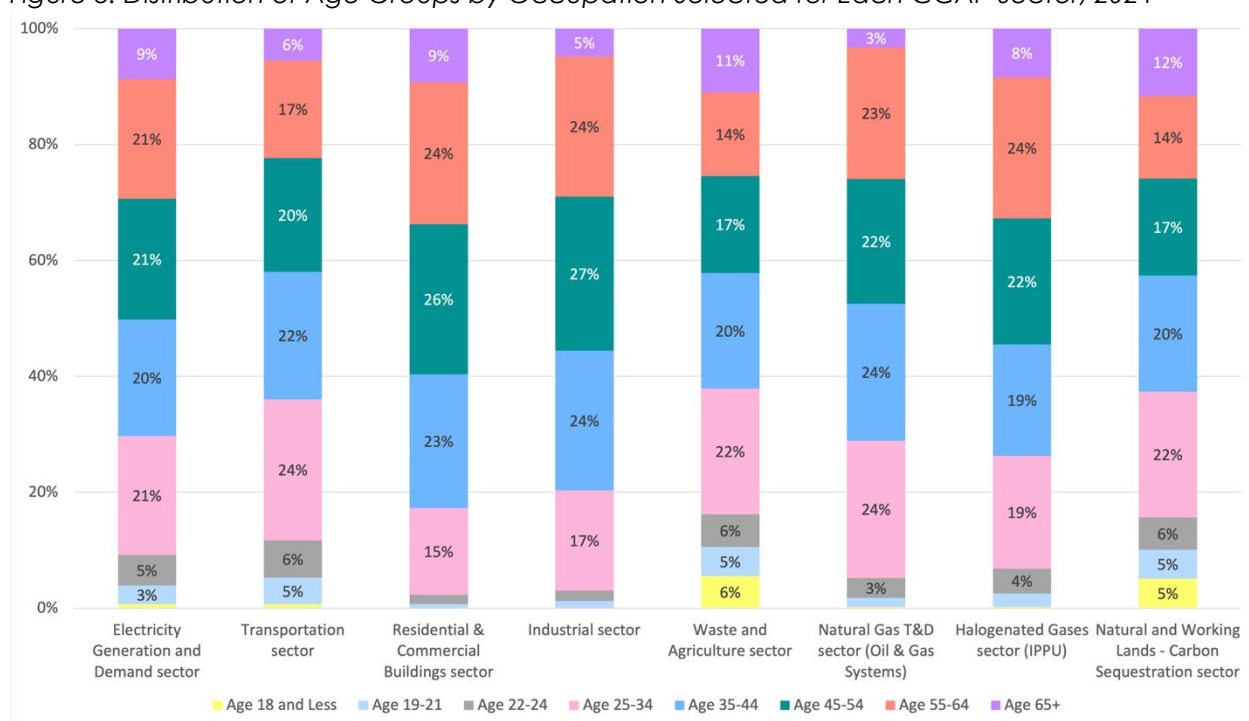
distribution, the Transportation sector, the Residential & Commercial Buildings sector, and the Natural Gas T&D sector sectors exhibit the lowest female representation, with workforces composed of over 95% male workers. These results highlight persistent gender imbalances across Green Economy occupations, as well as the importance of developing strategies to promote greater gender diversity in the workforce. While these results differ slightly from those observed in Figure 2, the variation primarily reflects the specific occupations chosen to represent each sector. Nevertheless, limited female representation is prevalent in the sectors, whether considering industries or occupations.

Table 5. Proportion of Male Workers by Occupation Selected for Each CCAP Sector, 2024

Sector	Percentage
Electricity Generation and Demand sector	56.4
Transportation sector	98.2
Residential & Commercial Buildings sector	95.6
Industrial sector	90.9
Waste and Agriculture sector	67.1
Natural Gas T&D sector	95.2
Halogenated Gases sector (IPPU)	76.9
Natural and Working Lands - Carbon Sequestration sector	65.7

Figure 8 displays the age distribution of the workforce across the selected occupations for the eight sectors in 2024. Three trends are relevant to highlight. First, consistent with the industry-level data, the majority of workers in each sector fall within the 25–54 age range, considered the prime working age, with the Natural Gas T&D sector showing the highest share in this group at 69%. Second, the Waste and Agriculture sector stands out for its age diversity, with a significant proportion of younger workers (38% under age 35) as well as a notable share of older workers (11% aged 65 and over). These occupations are closely followed in diversity by the Natural and Working Lands - Carbon Sequestration sector. Lastly, the Residential & Commercial Buildings sector has the largest proportion of workers aged 55 and older (34%), suggesting an aging workforce in that sector.

Figure 8. Distribution of Age Groups by Occupation Selected for Each CCAP Sector, 2024

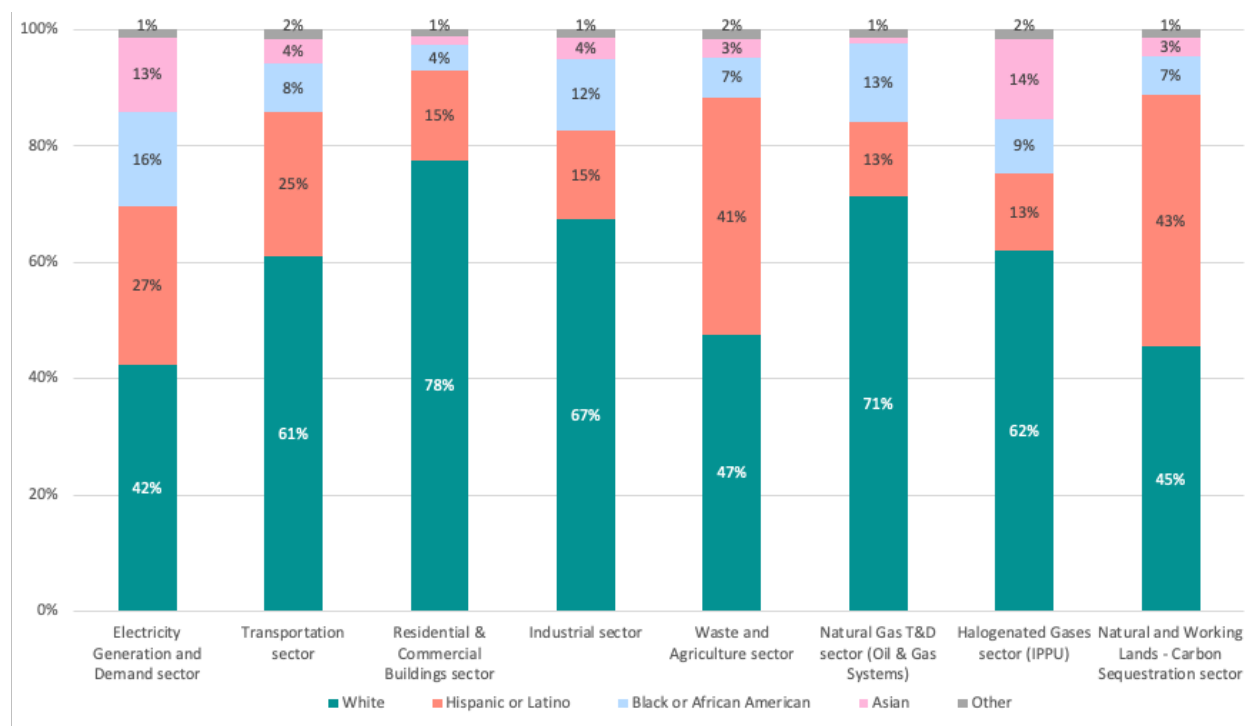


Note: The age group percentages for the following sectors are calculated as weighted averages of the occupations representing each of them: "Electricity Generation and Demand sector," "Transportation sector," "Waste and Agriculture sector," and "Natural and Working Lands - Carbon Sequestration sector." All values have been rounded to the nearest whole number to enhance readability and avoid decimal precision.

Figure 9 presents the racial and ethnic composition of the workforce across the selected occupations for the eight sectors in 2024. Consistent with the patterns observed in the industry-level analysis, White workers constitute the largest share of the workforce in all sectors, ranging from 78% in the Residential & Commercial Buildings sector to 42% in the Electricity Generation and Demand sector. In most sectors, workforce composition follows a similar descending pattern: White, Hispanic or Latino, Black or African American, and Asian. However, the Halogenated Gases sector (IPPU) stands out for having a significantly higher proportion of Asian workers, who represent 14% of the select occupation's workforce, second only to White workers at 62%.

The Natural and Working Lands - Carbon Sequestration sector's selected occupation emerges as the most racially and ethnically diverse. Hispanic or Latino workers make up 43% of its workforce, nearly equal to the 45% share of White workers. This sector also stands out as the second most diverse in terms of gender and age, as noted previously. Meanwhile, the highest representation of Black or African American workers is found in the Electricity Generation and Demand sector (16%).

Figure 9. Distribution of Race/Ethnicity Groups by Occupation Selected for Each Sector, 2024



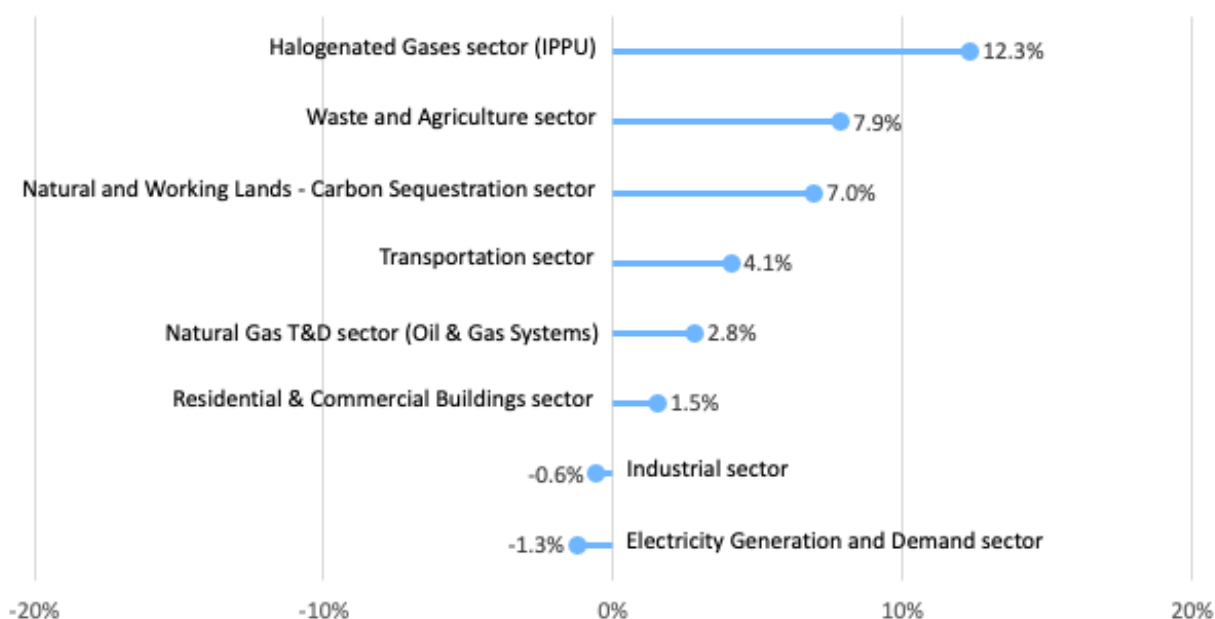
Note: The "Other" category includes individuals identified as American Indian or Alaska Native, Native Hawaiian or Other Pacific Islander, or Two or More Races. These categories have been combined to protect confidentiality due to small sample sizes. Additionally, the results for "Electricity Generation and Demand sector," "Transportation sector," "Waste and Agriculture sector," and "Natural and Working Lands - Carbon Sequestration sector" are calculated as weighted averages of the occupations representing each sector. Finally, the values have been rounded for simplicity and to avoid displaying decimals.

Figure 10 illustrates the projected percentage change in workforce size across the occupations selected for the eight sectors over the next ten years. In general, most sectors are expected to increase their workforces, with projected growth ranging from 2% to 12%. These estimates are broadly consistent

with the trends shown in the industry-level analysis, though the occupation-level data reflect a more uniform pattern of growth.

A key difference compared to Figure 5 is that the Industrial sector's occupation is expected to marginally decline. The anticipated decline in the Industrial sector aligns with the downward trend observed since 2021 in Figure 7 and may be influenced by the specific occupation chosen to represent the sector. On the contrary, among the sectors with the strongest projected growth, the Halogenated Gases sector (IPPU) leads with a 12% increase, followed by the Waste and Agriculture sector at approximately 8%, and the Natural and Working Lands - Carbon Sequestration sector area at 9%. Nevertheless, the results should be interpreted with caution, as they are shaped by the specific occupations chosen to represent each sector—choices that, while illustrative, may not fully capture the diversity and complexity within each sector. Researchers again note that projections data is limited in scope and may not always align with other data sources, nor account for the diversity of factors that may influence occupational trends.

Figure 10. Expected Percentage Change in Workforce by Occupation Selected for Each CCAP Sector, 2024–2034



Note: The expected percentage change for “Electricity Generation and Demand sector,” “Transportation sector,” “Waste and Agriculture sector,” and “Natural and Working Lands - Carbon Sequestration sector” is calculated as a weighted average of the occupations representing each sector.

Summarizing the analysis of the occupations in the Green Economy, researchers found some variation in workforce trends from 2014 to 2024. Half of the eight sectors maintained relatively small and stable workforce sizes over time, while the other half showed more dynamic shifts. Three sectors’ occupations—Electricity Generation and Demand sector, Transportation sector, and the Residential & Commercial Buildings sector—experienced upward trends in employment, whereas the Waste and Agriculture sector saw a modest decline. These differences are also reflected in wage levels. The Natural and Working Lands - Carbon Sequestration sector had the lowest median annual earnings, while the Residential & Commercial Buildings sector offered the highest for most of the years. Although some divergence between earnings and employment trends may suggest labor imbalances, the data do not suggest a definitive conclusion about labor shortages or surpluses in these occupations. Nevertheless, to address these potential disparities, later sections in this report include career and

employment guidance and resources provided by the New Jersey Department of Labor and include key reference materials, such as the U.S. Bureau of Labor Statistics' Occupational Outlook Handbook.¹⁷

Regarding workforce demographics, most occupations are predominantly male, with men accounting for between 56% and 98% of workers. The majority of workers also fall within the 25 to 54 age range. That said, some sectors stand out for their demographic diversity. The Waste and Agriculture sector, for example, has a relatively higher share of female workers (33%) and includes a broader distribution of age groups, from younger to older workers. Racial and ethnic composition across occupations is similarly concentrated: White workers make up the largest share, followed by Hispanic or Latino, Black or African American, and Asian workers. Notably, the Halogenated Gases sector (IPPU) has the highest proportion of Asian workers (14%), second only to White workers (62%).

Looking ahead, most of the sectors' occupations are projected to grow between 2024 and 2034, although these findings should be interpreted with caution. Through this analysis, the Heldrich Center highlights the workforce dynamics, inclusive of retrospective and projected growth, gender composition, age, racial and ethnic diversity, and earnings, for NJDEP's CCAP sectors and key occupations in the Green Economy.

Inventory of Workforce Development Infrastructure

Building upon the findings from the Green Economy labor market assessment, researchers further examined New Jersey's workforce capacity as it relates to the sectors for the CCAP by conducting a thorough inventory and examination of the current education and training landscape in the state. Through this [inventory](#), the Heldrich Center highlights areas of strength and areas for greater investment, ensuring that gaps in the education and training infrastructure can be addressed to maximize support for the sectors and measures outlined in the CCAP.

New Jersey's ongoing prioritization of and investments in greenhouse mitigation and clean energy needs to be supported by a robust education and training system. The education and training landscape must be properly equipped to teach the in-demand skills for the jobs and technologies of the future. In the absence of the appropriate education and training programs across the various regions of the state, the expansion of new technologies and creation of new jobs will be diminished without the critical underpinnings of a skilled and trained workforce. For these reasons, researchers offer the following analysis of the State's education and training landscape, as it pertains to NJDEP's eight sectors.

Researchers developed an [inventory](#) of education and training programs to assess the State's workforce capacity in the eight sectors identified by NJDEP. The inventory provides information on institution name, career cluster, occupation, program type, award level, and county for every education and training program by sector. Education and training providers included in the inventory are universities/colleges, community colleges, vocational-technical schools, and high schools.

Researchers identified **7437** education and training programs that offer certificate or degree opportunities in New Jersey for occupations associated with the eight sectors. As shown in Table 6, the majority of education and training programs in New Jersey are concentrated in the Natural Gas T&D sector, which accounts for 27% of all programs. This concentration is followed by the Industrial sector (nearly 23%) and the Residential & Commercial Buildings sector (19%). In contrast, the Halogenated Gases sector (IPPU) has the fewest programs, representing just 0.7%, with the Transportation sector slightly higher at 1.5%.

¹⁷ <https://www.bls.gov/ooh/>

Table 6. Percentage of Education and Training Programs by CCAP Sector

	Sector	Number of Education and Training Programs	Percentage of Education and Training Programs
1	Electricity Generation and Demand sector	945	12.7%
2	Transportation sector	111	1.5%
3	Residential & Commercial Buildings sector	1,410	19.0%
4	Industrial sector	1,740	23.4%
5	Waste and Agricultural sector	981	13.2%
6	Natural Gas T&D sector	2,009	27.0%
7	Halogenated Gases sector (IPPU)	54	0.7%
8	Natural and Working Lands - Carbon Sequestration sector	187	2.5%
	Total	7437	100%

Additionally, researchers have included NJDEP's [Overburdened Community \(OBC\) data](#) in the [inventory](#) of education and training programs to further examine access to education and training from the lens of underserved populations in the state. NJDEP defines OBCs as block groups with:

1. At least 35 percent low-income households; or
2. At least 40 percent of the residents identify as minority or as members of a State recognized tribal community; or
3. At least 40 percent of the households have limited English proficiency.¹⁸

As seen in Table 7, researchers used OBC data to assess the number of education and training programs in counties with higher frequencies of limited English proficiency, low income, and/or minority populations.

¹⁸ <https://dep.nj.gov/ej/communities/>

Table 7. Education and Training Program Information with Limited English Proficiency, Low Income, and Minority Populations by Region and County

Region	County	Number of Programs	Number of Providers	Averaged Percentage of Limited English Proficiency	Averaged Percentage Low Income	Averaged Percentage Minority
North	Bergen	543	15	10.54	19.08	62.45
	Essex	716	16	9.98	33.64	82.21
	Hudson	566	10	14.97	33.37	75.54
	Morris	371	12	10.09	21.15	58.40
	Passaic	545	8	19.52	39.58	79.25
	Sussex	150	2	7.02	29.91	31.98
	Union	244	11	15.93	28.27	77.86
	Warren	126	3	2.91	33.57	43.58
Central	Hunterdon	18	1	12.85	28.55	57.22
	Mercer	744	11	10.54	34.54	71.39
	Middlesex	762	17	9.38	20.66	68.32
	Somerset	168	4	7.77	16.47	63.97
South	Atlantic	220	6	9.48	42.55	64.91
	Burlington	227	5	3.06	23.55	58.13
	Camden	260	8	7.91	38.06	70.67
	Cape May	12	1	3.25	46.08	35.94
	Cumberland	141	2	8.58	43.38	66.08
	Gloucester	430	6	2.99	33.93	44.65
	Monmouth	255	10	7.05	29.99	55.10
	Ocean	352	22	2.65	48.28	23.58
	Salem	87	2	4.68	47.50	53.22

Note: The number of programs and providers excludes NULL values. Darker shaded cells represent higher numbers respectively to that column, whereas lighter shaded cells are lower numbers.

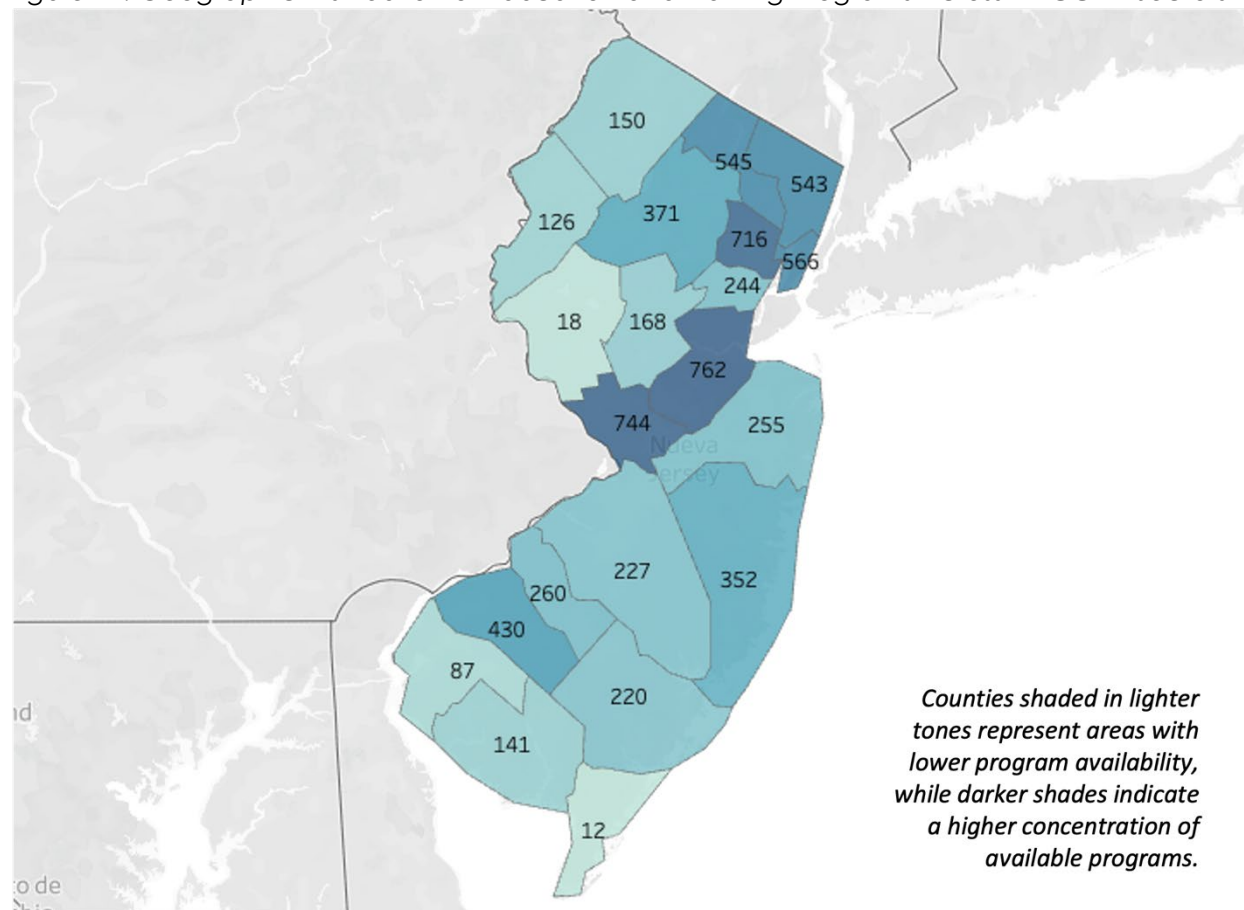
Table 7 reveals a positive correlation between the number of education and training providers and the variety of programs offered; regions with more providers tend to provide a broader range of programs. This pattern is especially evident in the northern and central parts of New Jersey, where providers are concentrated in counties such as Middlesex, Essex, and Bergen. Ocean County has the highest number of providers overall, primarily due to the significant presence of religious educational institutions.

Counties with higher frequencies of OBCs, specifically limited English proficiency, low-income, and minority populations, are Passaic, Union, Essex, Hudson, and Camden. At the same time, these counties also contain more education and training providers and, therefore, programs. These findings are consistent with population density data, and are therefore, not surprising.

The data also highlights the dynamics of rural counties in the southern region of the state which contain high levels of limited English proficiency, low-income, and/or minority populations. The counties of Camden, Cumberland, Atlantic, and Monmouth are of particular note. This population dynamic is coupled with the existence of fewer education and training providers, thereby limiting access to programs. For this reason, targeted workforce development strategies may be necessary in these key communities to ensure equitable access to education and training programs in NJDEP's CCAP sectors.

In examining the relationship between the number of programs and the demographic indicators from the OBC data, several trends emerge. Counties with a higher number of education and training programs, such as Middlesex, Mercer, Essex, and Bergen, tend to show higher percentages of minority populations (as in Essex), lower percentages of low-income individuals (as seen in Bergen and Middlesex), and generally lower rates of limited English proficiency, with the exception of Passaic and Hudson. In contrast, counties in the southern region of New Jersey, which have the fewest programs, are characterized by higher proportions of low-income residents and the lowest levels of limited English proficiency.

Figure 11. Geographic Distribution of Education and Training Programs Across All CCAP Sectors in New Jersey



Note: Programs and providers with NULL values are excluded from the analysis.

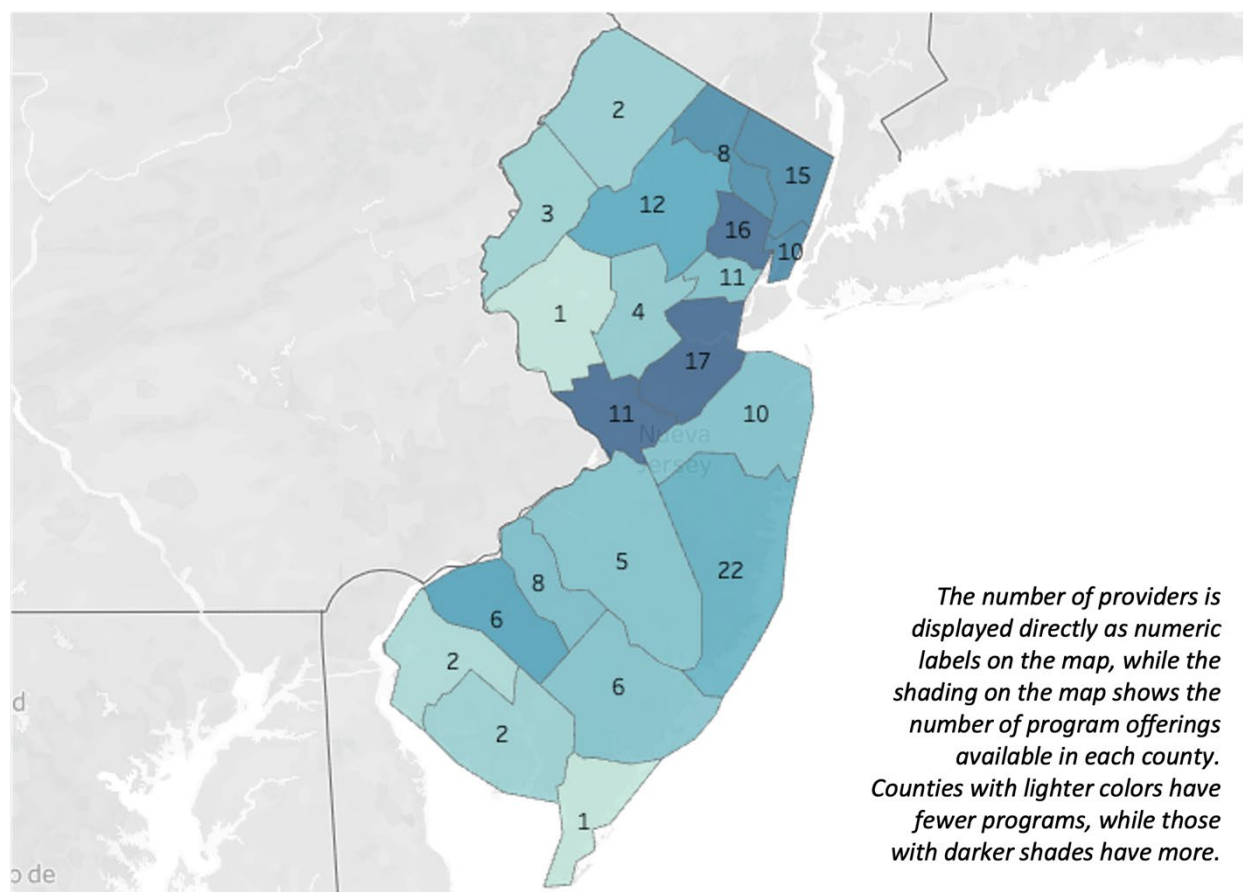
Figure 11 highlights the concentration of programs in Central and Northeastern New Jersey. This distribution may be influenced by several factors, including a lower percentage of low-income residents, the presence of large institutions such as Rutgers University, and the region's proximity to New York City.

However, when filtering the [inventory](#) for the programs that provide certifications, the map displays a broader distribution. In addition to the previously indicated concentration in Central and Northeastern New Jersey, a notable increase is observed in the Southern part of the state, particularly in Ocean, Gloucester, and Burlington counties.

Figure 12 shows that when filtering training providers to include only those offering certifications, a similar pattern emerges as with the number of programs. The concentration of providers extends beyond Central and Northeastern New Jersey into the Southern region, with notable increases in

Ocean, Monmouth, Camden, and Gloucester counties. This shift highlights a broader geographic distribution of certification-based training opportunities across the state.

Figure 12. Geographic Distribution of Education and Training Providers Across All CCAP Sectors in New Jersey



Note: Programs and providers with NULL values are excluded from the analysis. Darker-shaded counties represent areas with a higher concentration of programs, while lighter-shaded counties indicate lower program availability. Ocean County should be considered an outlier in this figure, as the elevated number of programs is largely driven by the presence of several religious institutions.

The labor market assessment, inventory of education and training programs, and the examination of OBC data showcase key workforce dynamics in the current landscape of the Green Economy in the state. These data suggest a need for targeted workforce development strategies that aim to diversify the workforce supporting NJDEP's CCAP sectors, as well as a need for an expansion of education and training opportunities in key regions of the state. These dynamics will continue to be discussed further in this report.

Relevant Climate Investments in New Jersey

New Jersey's robust climate investments offer a unique landscape for NJDEP's CCAP sectors and measures. Researchers highlight some examples of critical investments and ongoing programs that contribute to the State's favorable conditions for the priorities laid out in NJDEP's CCAP. This list of relevant climate investments is not exhaustive but rather is intended to provide context. This section also serves as the foundation upon which the Heldrich Center formulates workforce development strategies for each of NJDEP's CCAP sectors.

Office of New Jersey Governor Philip Murphy

In 2018, Governor Philip Murphy signed [Executive Order No. 23](#), which acknowledged that New Jersey's low-income communities and communities of color have long faced disproportionately high and harmful levels of air, water, and soil pollution, which constitute potential risks to public health (New Jersey Office of the Governor, 2018). As a result of the Executive Order, NJDEP produced [Furthering the Promise: A Guidance Document for Advancing Environmental Justice Across State Government](#), offering a framework for State agencies to evaluate the environmental and subsequent health impacts of their programs and policies in overburdened communities in New Jersey (NJDEP, 2020). In 2021, the Governor signed [Executive Order No. 221](#), which established the Office of Climate Action and the Green Economy (OCAGE). The mission of the Office is to "provide strategic leadership, vision, and coordination in addressing climate change, the transition to green jobs and the green economy, paving the way for New Jersey's clean energy future and your commitment to environmental justice and equity" (Office of Climate Action & the Green Economy, 2025). More specifically, the Office of Climate Action and the Green Economy oversees the State's energy and climate investments across 14 executive orders, which are displayed in Table 8 below.

Table 8. New Jersey Executive Orders, Energy and Climate

Executive Order Number	Title of Executive Order	Date
No.7	Directs New Jersey to Reenter the Regional Greenhouse Gas Initiative	January 29, 2018
No.8	Promotes Offshore Wind Energy	January 31, 2018
No.23	Addresses Environmental Justice Issues in New Jersey's Urban Communities	April 20, 2018
No.28	Measures to Advance New Jersey's Clean Energy Economy	May 23, 2018
No.79	Establishing the Council on Offshore Wind	August 16, 2019
No.89	Establish Statewide Climate Change Resiliency Strategy	October 29, 2019
No. 92	Increase Offshore Wind Goal to 7,500 Megawatts by 2035	November 19, 2019
No.100	Regulatory Reform to Reduce Emissions and Adapt to Climate Change	January 27, 2020
No. 221	Establishing the Governor's Office of Climate Action and the Green Economy	February 16, 2021
No.274	Advances Climate Action to Secure New Jersey's Clean Energy Future	November 10, 2021
No.307	Increasing Offshore Wind Goal to 11,000 MW by 2040	September 21, 2022

<u>No.315</u>	Accelerate Target of 100% Clean Energy by 2035	February 15, 2023
<u>No.316</u>	Electrify Space Heating and Cooling Systems in 400,000 Homes and 20,000 Commercial Properties	February 15, 2023
<u>No.317</u>	Initiating a Process to Plan for the Future of the Natural Gas Utility in New Jersey	February 15, 2023

Source: Office of Climate Action & the Green Economy

New Jersey Department of Environmental Protection

The New Jersey Department of Environmental Protection (NJDEP) serves as the State's lead agency for advancing climate action and energy efficiency programs and investments. The programs described in this section specifically highlight NJDEP's ongoing efforts to advance job creation and foster career pathways and workforce development within New Jersey's growing Green Economy. Launched in 2021, NJDEP's [Youth Inclusion Initiative](#) is designed to empower young people ages 16 through 20 from New Jersey's overburdened communities by providing them with hands-on experiences, guidance from professionals, and exposure to the knowledge and skills essential for pursuing careers in the field of environmental protection (NJDEP, 2025). Youth participants gain access to a variety of NJDEP program areas, including but not limited to Water Resources Management, Contaminated Site Remediation and Redevelopment, Air, Energy and Materials Sustainability, Fish and Wildlife, Watershed and Land Management, and much more. In 2023, NJDEP, working in collaboration with the Governor's Office of Climate Action and the Green Economy, announced the [NJ Building our Resilient, Inclusive, and Diverse Green Economy](#) (NJ BRIDGE) Initiative grant award, which maintains the goal of funding organizations promoting innovative approaches to both developing and supporting a diverse and inclusive green jobs workforce for New Jersey residents (New Jersey Office of the Governor, 2023). In 2024, USEPA announced that NJDEP, alongside other state partners, would receive a Climate Pollution Reduction Grant, specifically an implementation grant, with the intention of cutting climate pollution on I-95, a critical transportation corridor in the region. The multi-state partnership, known as the [Clean Corridor Coalition](#), implements community-driven solutions to address the ongoing climate crisis, reduce air pollution, advance environmental justice, and accelerate the region's transition to clean energy (USEPA, 2024). Through this initiative, NJDEP is advancing the clean energy transition within the Transportation sector while also supporting the creation of high-quality green jobs. This effort is further reinforced by the provision of job training opportunities funded through this grant (USEPA, 2024). Lastly, also in 2024, NJDEP's [New Jersey Forest Service Urban and Community Forestry Program \(NJUCF\) Leafing Out Grants-Education](#) sought to provide both technical and financial assistance to overburdened communities across the state for the purpose of establishing, expanding, and fostering healthy urban and community forests. NJUCF is a four-year educational and training grant that provides local areas with the necessary funding to support qualified forestry training and educational opportunities (NJDEP, 2024).

Through these coordinated program offerings and investments, which are just a sampling of NJDEP's full portfolio, the state agency ensures that New Jersey is reducing greenhouse gas emissions, enhancing community awareness and resilience to climate impacts, protecting natural resources, integrating environmental justice into the State's climate policies, and expanding high-quality employment opportunities in the Green Economy to historically underserved populations. With NJDEP's investments in green jobs, the state agency is not only driving progress toward New Jersey's clean energy and climate goals but is also catalyzing economic growth, workforce development, and social equity throughout the state.

The New Jersey Economic Development Authority

The New Jersey Economic Development Authority (NJEDA) offers a broad range of programs, incentives, and grant opportunities designed to advance the State's climate goals and expand equitable access to opportunities within the Green Economy. In 2024, the NJEDA established the [New Jersey Green Bank](#) (NJGB) to catalyze investment in the clean energy sector and advance New Jersey's goal of an equitable transition to 100 percent clean energy. The NJGB invests in projects, technologies, and companies that further the State's climate goals, which include, but are not limited to, zero-emission transportation, building decarbonization and resiliency, and clean energy generation and storage (NJEDA, 2024). Moreover, other relevant programs offered through NJEDA include, but are not limited to:

1. [New Jersey Clean Energy Loans](#) (NJ CELs), a loan program for clean energy projects and businesses in the state;
2. New Jersey Zero-Emission Incentive Program ([NJ ZIP](#)), a voucher program to encourage entities to purchase zero-emission vehicles;
3. [NJ Zero Emission Vehicle \(ZEV\) Financing](#), a loan program to support commercial and industrial organizations seeking assistance to purchase zero-emission vehicles;
4. [Garden State Commercial Property Assessed Clean Energy \(C-PACE\) Program](#), a financing program for renewable energy, energy efficiency, water conservation, and certain types of resiliency-related improvements in real estate; and
5. [NJ COOL](#), a financial assistance program for commercial, industrial, and institutional building owners that seek to retrofit existing buildings' heating and cooling systems to reduce greenhouse gas emissions in State-designated Overburdened Community and Adjacent Community census blocks (NJEDA, 2025).

Lastly, in 2024, NJEDA launched the [Green Workforce Training Grant Challenge](#), which was a funding opportunity designed to support workforce development programs that strengthen New Jersey's Green Economy talent pipeline, with particular emphasis on serving overburdened communities. The priority industries of the grant include Offshore Wind, Other Renewable Energy Technologies, Green Design and Construction, Environmental and Green Infrastructure, Grid Resilience, Clean Transportation, and Energy Efficiency.

New Jersey Department of Labor and Workforce Development

The New Jersey Department of Labor and Workforce Development (NJDOLE) has also been involved with climate resiliency efforts, particularly those centered on supporting the workforce in emerging sectors of the Green Economy. In 2021, NJDOLE, working in partnership with Public Service Electric and Gas (PSE&G), launched the [Clean Energy Jobs Training Program](#). This ongoing initiative intends to recruit, train, and hire New Jersey residents for career opportunities in renewable energy. The program provides comprehensive support, which includes workforce readiness and financial literacy education, wraparound services, job coaching, and job placement to facilitate program participants' transition into jobs with PSE&G's contracted suppliers and employers (NJDOLE, 2021). NJDOLE's administration of the [Growing Apprenticeship in Nontraditional Sectors](#) (GAINS) grant program further highlights the agency's intention to expand diverse pathways into green jobs. The GAINS grant¹⁹ prioritizes sectors related to the Green Economy, including but not limited to Energy, Utilities and Infrastructure; Green Jobs/Renewable Energy; Other Science, Technology, Engineering, and Mathematics (STEM) related sectors/occupations; and Construction & Building Trades (Business.NJ.Gov, 2025). Furthermore, NJDOLE operates the [NJ Training Explorer](#), which connects people with quality job training programs, including

¹⁹ https://www.nj.gov/labor/assets/PDFs/Grants/FY25/FY2025_002_GAINS%20Round%202_NGO_.pdf

opportunities in the Green Economy. Additionally, NJDOL tools such as the [New Jersey Career Navigator](#) and [New Jersey Career Pathway](#) offer critical guidance for New Jersey residents in search of more information on pathways into green jobs and careers. NJDOL also offers [labor market spotlights](#) on the State's Green Economy, which includes green occupation data, and utilizes insights and data from the U.S. Bureau of Labor Statistics' [Occupational Outlook Handbook](#). These collective programs and investments seek to expand career pathways, as well as access to supportive resources on potential pathways, for those exploring employment opportunities in New Jersey's growing Green Economy.

This assessment of climate-focused programming and ongoing investments across key State entities, including the Office of the Governor, NJDEP, NJEDA, and NJDOL, serves to highlight the breadth and depth of initiatives aimed at expanding the Green Economy in New Jersey, with a particular emphasis on growing a skilled and trained workforce for green jobs. These robust offerings in the state further underscore the strong foundation upon which additional workforce development strategies could be considered in support of NJDEP's CCAP sectors and measures outlined in the CCAP.

Barriers for Underserved Communities in New Jersey

Based on the Heldrich Center's research for both the PCAP and CCAP submissions, researchers have identified seven common barriers that OBC populations may experience in accessing job opportunities, with a particular focus on employment in the Green Economy. While this list is not exhaustive of all challenges that historically underserved communities and/or OBCs may experience, these seven barriers have been identified as the most significant from a workforce development standpoint, as they directly affect individuals' ability to access and maintain education, training, and employment opportunities. Addressing these barriers will be critical to expanding equitable access to career onramps that put people on pathways to high-quality, good jobs. Increasing access to this education-to-employment trajectory will also enable individuals from OBCs to increase their income, build wealth, and attain long-term economic advancement.

The Heldrich Center identifies the following seven barriers that underserved communities may experience in accessing education, training, and employment opportunities.

- ◇ Limited access to education systems that provide affordable career and vocational-technical education and training opportunities.
- ◇ Limited awareness of available career pathways, including the skills, education, and training required to access high-quality, good jobs.
- ◇ Limited awareness of public programs, services, and resources that support career development and skills training.
- ◇ Limited awareness of public programs, services, and resources that provide wraparound services, addressing childcare and family issues, crime and substance abuse, housing instability, disabilities, and mental and physical health, and other needs.
- ◇ Inadequate policies, frameworks, and incentives to promote diverse and inclusive hiring practices.
- ◇ Limited availability of high-quality, good jobs.
- ◇ Limited access to reliable, affordable personal or public transportation.

While these barriers are not exclusive to education and employment in the Green Economy, they are likely present, as these dynamics create obstacles across all industries throughout the State of New Jersey. As referenced earlier in this report, the Heldrich Center's analysis of the labor market of the Green Economy, examination of the education and training landscape, and assessment of the OBC data highlights some of these dynamics and barriers. Furthermore, additional ongoing research on

broad workforce dynamics, as well as the Green Economy workforce in New Jersey, echoes the prevalence of these barriers in OBCs.

For example, a 2019 study by the Federal Reserve Bank of Kansas City highlighted how an absence of reliable and accessible transportation is a significant and prohibitive employment barrier, which is more pronounced for low- and moderate-income (LMI) communities than non-LMI communities (Edmiston, 2019). In 2022, the NJ Council on the Green Economy's [Green Jobs For A Sustainable Future Report](#) called for the state to consider approaches to create stricter job quality standards in green building and the development of energy-efficient, affordable housing (NJ Council on the Green Economy, 2022). More recently, the New Jersey Governor's Office of Climate Action and the Green Economy's [Growing Green Jobs](#) report, also noted that in their assessment of New Jersey's green workforce ecosystem that there is a lack of understanding about career pathways and opportunities in clean energy and the green economy. The report added that this knowledge gap is particularly prevalent for workers, students, and underserved populations in OBCs (The New Jersey Governor's Office of Climate Action and the Green Economy, 2025). These select references reaffirm the complex dynamics that impact access to education, training, and employment opportunities within these communities. With targeted workforce development strategies and investments, the state can systemically work towards addressing these barriers that keep underserved populations and OBCs out of education and employment opportunities in the Green Economy, as well as other industries, that would promote long-term economic advancement and increase community resilience.

Workforce Development Strategies

Based on the Heldrich Center's expertise in the field of workforce development, researchers identify eight categories of workforce development strategies that may be appropriate for NJDEP's sectors for the CCAP. These eight categories of workforce development strategies are as follows:

- ◇ Develop and Expand the Talent Pipeline
- ◇ Upskill and/or Reskill the Existing Workforce
- ◇ Promote Career Awareness Campaign in Secondary and Post-secondary Education
- ◇ Advance Locally Driven Career Awareness and Engagement Strategies
- ◇ Foster Engagement with State and Local Workforce Development Systems
- ◇ Create Employer Engagement Networks
- ◇ Connect Employers to Education
- ◇ Encourage High-Touch Supportive and Wraparound Services

The Heldrich Center offers workforce development strategies for each of the [eight sectors](#) included in the CCAP – *Electricity Generation and Demand sector, Transportation sector, Residential & Commercial Buildings sector, Industrial sector, Waste and Agriculture sector, Natural Gas T&D sector, Halogenated Gases sector (IPPU), and Natural and Working Lands - Carbon Sequestration sector*. For this section of the Workforce Planning Analysis, researchers will identify 1) the CCAP sector and the sector's relevant corresponding measures, 2) the appropriate category or categories of the workforce development strategies referenced above, and 3) the sector-specific workforce development strategy recommendation that could be considered for implementation. These workforce development strategies identified for inclusion in the CCAP are in alignment with the recommendations from the [Green Jobs For A Sustainable Future Report](#), put forth by the NJ Council on the Green Economy. As such, these workforce development strategies highlight an avenue by which to foster greater investment and alignment in workforce, education, employer, and sector needs.

CCAP Sector 1: Electricity Generation and Demand sector

Workforce Development Strategy Category: Promote Career Awareness Campaign in Secondary and Post-Secondary Education

To support New Jersey's offshore wind, solar, and nuclear energy generation plans, as well as increase utilization of battery storage, there is a need to strengthen career awareness in secondary and post-secondary education institutions for career pathways in this sector.

NJDEP, working in coordination with relevant stakeholders, could integrate clean energy curricula, specifically solar, nuclear, and offshore wind concepts, and battery storage design, utilization, and installation, into secondary and post-secondary institutions, including technical schools, community colleges, and union apprenticeship programs. Relevant stakeholders may include, but are not limited to, the New Jersey Department of Education, the New Jersey Council of County Colleges, and local County Boards of Commissioners.

Early integration of key concepts, such as clean energy resources and storage technology, into K-12 and post-secondary education curricula could instill greater career curiosity and awareness in students, which could then translate to the exploration of career pathways in the Green Economy. NJDEP might also consider how to build upon models of engagement and investments already underway in New Jersey, including NJEDA's [Wind Institute for Innovation and Training](#) and the New Jersey Council of County Colleges' [NJ Pathways project](#), which focuses on offshore wind career awareness and professional development through the Center of Workforce Innovation for Offshore Wind. Specifically, through the NJ Pathways project, Cape May County Technical High School District has served as the professional development coordinator for secondary schools implementing the "Preparing for a Career in the Offshore Wind Industry" or the "Beach Town, USA" experiences (NJ Pathways, 2024).

These ongoing initiatives offer a model and lay the foundation by which relevant stakeholders in the state could expand access to and awareness of these career development resources, occupations, and pathways for students. This model of engagement could be replicated for solar and nuclear energy career awareness, as well as for battery storage and its associated occupations and career pathways. According to data from Lightcast²⁰, key occupations within the industry of Solar Electric Power Generation include: 1) Construction and Extraction Occupations, 2) Business and Financial Operations Occupations, 3) Management Occupations, and 4) Sales and Related Occupations. Key occupations within the industry of Nuclear Electric Power Generation include: 1) Protective Service Occupations, 2) Installation, Maintenance and Repair Occupations, 3) Business and Financial Operations Occupations, and 4) Architecture and Engineering Occupations. Lastly, the data shows that a key occupation for Battery Manufacturing is Production Occupations, representing 55.5% of employment in this industry. While the occupation categories referenced above are generally broad, they offer a snapshot of potential occupational groups for further consideration and exploration. Awareness of occupations utilizing emerging technologies across these growing industries will be critical for New Jersey's development of offshore wind, solar, and nuclear energy, and with the growth

²⁰ These occupational groups, compiled from Lightcast data, are generally broad in scope, encompassing multiple related job titles and roles within the labor market. As such, they provide a useful overview but may not capture the full detail, scope, or specialization of individual occupations in these sectors.

in use of battery storage. NJDEP and other relevant stakeholders could consider ways to incorporate occupation and career pathway awareness for solar and nuclear energy, as well as battery storage, in the state while also continuing to expand on the ongoing programming offered for offshore wind career awareness and training.

Moreover, to complement the expansion and integration of clean energy curricula in secondary and post-secondary institutions, relevant stakeholders could also regularly examine labor market data for key industry segments of the Electricity Generation and Demand sector. The growing footprint of these industries in the coming decades in the state will necessitate closer examination of employer needs, required skills, and perceived skill gaps. The insights from labor market analyses that explore these critical workforce dynamics would allow for the targeted design and continued refinement of education and training offerings, thereby creating a positive feedback loop between labor market demands, workforce preparation, and career awareness campaigns.

CCAP Sector 2: Transportation sector

Workforce Development Strategy Category: Develop and Expand the Talent Pipeline

Expand and standardize formal education and certification pathways for specialized workforce training programs for electric vehicles (EV) charging infrastructure with New Jersey's Community Colleges and Technical Schools.

Within the Transportation sector, New Jersey state agencies are supporting the expansion of and incentivizing the purchase of electric vehicles for both personal and commercial usage. NJDEP's CCAP measures to reduce GHG emissions and implement public transit projects further support the State's ongoing investments in the EV industry within the Transportation sector. Research from the World Resources Institute (WRI) on EV training program trends suggests that the burgeoning EV industry will require a diversity of workers engaged in scientific research to improve the EV technology over time, refine the technologies' design and development, and progress EV battery manufacturing (Shrestha et.al, 2025). There will also be a need for workers engaged in EV maintenance and repair, and charging infrastructure development (Shrestha et.al, 2025).

The diversity of these roles will necessitate a variety of education and training pathways to sustainably support growth in this sector. While NJDEP is advancing EV infrastructure development through the [Clean Corridor Coalition](#) project, additional efforts are needed to expand and standardize formal education and training pathways for high-quality jobs and careers in the EV sector. Due to the nature of the education and certification required for jobs in the EV industry, community colleges and technical schools are well-positioned to play a central role in preparing students for job opportunities deploying emerging technologies in this industry (Shrestha et.al, 2025). These institutions often serve a more diverse population of students, in comparison to public four-year colleges, thereby offering another means by which to ensure that underserved populations in OBCs have access to the programs and pathways that lead to high-quality jobs in the Green Economy (Cohen & Berman, 2015). While some of New Jersey's community colleges are in the process of expanding their EV education offerings, such as Brookdale Community College's recent addition of an [Electric Vehicle Education for New Jersey \(EVE-NJ\) program](#), developments such as this can be expanded and standardized throughout New Jersey to offer greater access to diverse communities.

Research from the WRI further offers insights into specific EV education and training programs that could be developed across key segments of the industry, specifically EV manufacturing, EV

maintenance and repair, and EV charging. These examples compiled by WRI researchers, as seen in Table 9, offer potential pathways for New Jersey, and other states, to consider regarding the cultivation of EV-specific education and training programs to further support the robust development of career pathways in the Green Economy.

Table 9. WRI EV-Specific Programs.

Industry Segment	Non-EV Specific Programs	EV-Specific Programs
EV Manufacturing	◇ Welding ◇ Mechanical Engineering	◇ Electric Vehicle Production Technology ◇ Electric Drive Vehicle Engineering
EV Maintenance & Repair	◇ Automotive Systems/Technologies ◇ Automotive Maintenance & Repair	◇ Alternative Fuels and Hybrid Technician ◇ Automotive Systems/Technologies, with EV focused courses
EV Charging	◇ Electric Engineering ◇ Electrician/Electrical Technician	◇ Electric Vehicle Supply Equipment Technician ◇ Electrical Systems or Engineering, with Electric Vehicle Supply Equipment focused courses

Source: World Resources Institute. WRI Researchers present this data using the College Navigator database from the National Center for Education Statistics. *The Heldrich Center did not draft these EV-specific program recommendations.*

New Jersey can build upon the examples identified by WRI researchers to expand and standardize formal education and certification pathways for specialized workforce training programs for the EV industry in New Jersey. These efforts could be undertaken in partnership with the State's community colleges and technical schools in order to foster a robust network of accessible entry points for New Jersey residents into EV-related career pathways and high-quality jobs.

CCAP Sector 3: Residential & Commercial Buildings sector

Workforce Development Strategy Category: Advance Locally Driven Career Awareness and Engagement Strategies; Connect Employers to Education; Upskill and/or Reskill the Existing Workforce

Support and enhance workforce development infrastructure to meet the growing demand for electrifying the Residential & Commercial Buildings sector.

NJDEP's CCAP measures for this sector notably include accelerating heat pump installations, establishing all-electric building codes, and adopting statewide building performance standards, among others. These measures will serve to reduce carbon emissions, enhance indoor air quality, and decrease energy costs for the Residential & Commercial Buildings sector throughout the state. These priorities are also in alignment with the [Regional Greenhouse Gas Initiative Strategic Funding Plan 2023-2025](#), which prioritizes accelerating healthy homes and building decarbonization. The plan highlights that funding from NJBPU and NJEDA will support workforce readiness to build, install, repair, and

maintain emerging technologies, which underpins meeting the plan's stated goals (NJEDA, NJBPU, NJDEP, 2024).

To accelerate the transition to electrifying the Residential & Commercial Buildings sector, expanded workforce development support is needed to meet the growing demand for skilled workers in this key sector for the State of New Jersey. Recent research from the [American Council for an Energy-Efficient Economy](#) (ACEEE), a nonprofit research organization, examined the current workforce challenges associated with residential decarbonization projects. Their research identified a series of five key workforce challenges in this sector that may be applicable to New Jersey's residential and commercial building electrification landscape as well. ACEEE's research identified the following workforce challenges²¹:

1. Low awareness and negative perceptions about energy efficiency careers;
2. A shortage of training programs for energy efficiency careers that integrate technical skills, soft skills training, employer needs, and market demands;
3. Skills misalignment due to an absence of standardized technical curricula;
4. Limited access to new employment opportunities, professional development, and career advancement within energy efficiency occupations; and
5. A lack of clarity and standardization for contractor licensing requirements and business practices (Srivastava, et.al, 2025).

These workforce challenges speak to a robust set of potential obstacles that may hinder workforce growth in this sector for the State of New Jersey. With these challenges in mind, researchers recommend a multi-faceted approach to strengthen the workforce development infrastructure for careers in energy efficiency. Heldrich Center researchers specifically recommend advancing locally driven career awareness strategies while strengthening connections between employers and educational institutions to align opportunities to develop new talent, as well as reskill the existing workforce. Strengthening partnerships to foster collaboration between employers and educational institutions, specifically community colleges, technical schools, and the K-12 system, could support building both a more responsive and inclusive workforce development infrastructure for energy efficiency jobs and the Residential & Commercial Building sector overall.

First, these critical partnerships could help ensure that students are exposed early to a broad range of career pathways, particularly for emerging industries. Second, by working closely with employers, educational institutions can align and standardize curricula, credentials, and hands-on learning opportunities to impart students with in-demand skills and competencies, thereby increasing access to impactful and accessible training opportunities. In this way, standardizing education and training resources and programs could help to address and close perceived skill gaps that often contribute to labor market misalignments. Moreover, with more prolific standardized curricula and training opportunities, employers help foster a pathway for a reliable future pipeline of skilled talent as well as a means by which the existing workforce can engage in reskilling, upskilling, and professional development opportunities. Lastly, as suggested by Srivastava and colleagues from ACEEE, sector stakeholders could consider ways to provide accessible and standardized training to the current and future workforce of contractors to support their development and enable them to meet licensing and continuing education requirements (Srivastava, et.al, 2025). Taken together, these workforce development strategies offer a diverse means to ensure that greater alignment between employers and education institutes reaps benefits focused on increasing career awareness, developing more

²¹ These workforce challenges have been identified by researchers at the American Council for an Energy-Efficient Economy as part of the Building a Workforce for Energy-Efficient Homes report. The Heldrich Center did not identify these workforce challenges but rather references key research in this sector for inclusion in the CCAP.

training opportunities aligned with in-demand skills, and standardizing curricula and resources to facilitate worker recruitment and retention in energy efficiency occupations.

CCAP Sector 4: Industrial sector

Workforce Development Strategy Category: Upskill and/or Reskill the Existing Workforce

Promote and expand certification and upskilling opportunities for the existing workforce to attain the skills needed to operate and maintain energy-efficient technologies in manufacturing.

One of NJDEP's CCAP measures for the Industrial sector specifically includes adopting manufacturing equipment efficiency standards and offering incentives for the use of energy-efficient technologies in manufacturing. This CCAP measure promotes the adoption of new technologies, which will require a workforce trained and skilled in these emerging technologies to support their introduction, adoption, and maintenance in manufacturing. According to the labor market assessment, the Industrial sector has greater gender diversity among NJDEP's CCAP sectors, with 56% of the workforce identifying as male. As compared to other sectors included in this research, the Industrial sector is characterized by a more racially and ethnically diverse workforce, with 49% of workers identifying as White, 23% Asian, 17% Hispanic or Latino, and 9% Black or African American. Considering these workforce demographics, it appears that there is reasonable diversity within the current workforce, suggesting sufficient career awareness and uptake from diverse populations and communities in the state.

A workforce development strategy for the Industrial sector could focus on upskilling the existing workforce through education and training opportunities that specifically focus on energy-efficient manufacturing. As seen in the [inventory](#) of education and training programs, the Industrial sector accounts for 23.4% of education and training programs, the second-highest concentration of programs of NJDEP's CCAP sectors. This affords ample opportunity for refined and tailored curricula that entice the current workforce to seek upskilling and reskilling opportunities to ensure that their skills are competitive and match employers' needs in the future. Research from the University of Bergamo in Italy suggests that the green skills requested in the manufacturing sector can broadly be defined as Product-process Design, Big Data Analytics and Artificial Intelligence, Supply Chain Management, Circular Economy, and Energy Management (Lagorio et al., 2024). While this does not capture the specificity of skills, tools, and competencies required for working with energy-efficient manufacturing technologies, these five broad categories offer insight into the domains for incumbent workers to seek upskilling and reskilling learning opportunities.

Engagement with the State's vocational and technical schools and county colleges would support the alignment of curricula to reflect the emergence of new technologies. Several of the State's county colleges offer programming in advanced manufacturing, including but not limited to [the County College of Morris](#), [Rowan College of South Jersey](#), and [Hudson County Community College](#); therefore, the State could consider expanding upon the existing robust infrastructure of education and training opportunities to promote curricula alignment to reflect new technologies for the benefit of both future and incumbent workers.

CCAP Sector 5: Waste and Agriculture sector

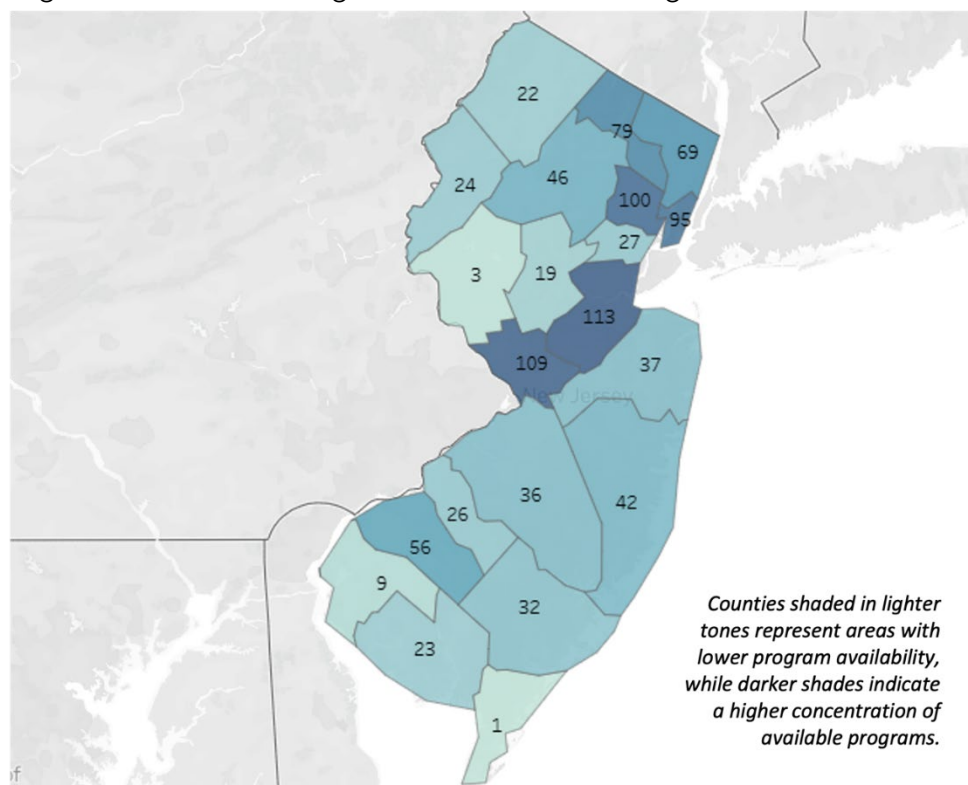
Workforce Development Strategy Category: Promote Career Awareness Campaign in Secondary and Post-Secondary Education; Advance Locally Driven Career Awareness and Engagement Strategies

Create a multipurpose awareness and education campaign designed to both promote regulatory compliance and increase awareness of career opportunities.

According to the [New Jersey Greenhouse Gas Inventory: 2025 Mid-Cycle Update Report](#), in 2022, the Waste and Agriculture sector accounted for approximately 6% of the state's net greenhouse gas emissions (NJDEP, 2025). To fulfill the mandate set forth by the state's 80x50 goals, emissions from these sectors need to be reduced by 20% by 2050. Building upon this work, NJDEP has put forth measures for the Waste and Agriculture sector as part of the CCAP, highlighting that the State intends to focus on clarifying regulatory requirements and guidelines related to landfill capping, emissions monitoring and control at landfills and wastewater treatment plants, and food waste recycling and diversion. With this emphasis placed on building a more robust regulatory framework, these initiatives could be supported by a multipurpose awareness and education campaign to foster efforts to both improve compliance and generate career awareness. In this way, a multi-pronged awareness campaign strategy could be designed to inform, engage, and incentivize a range of diverse stakeholders, relevant to advancing the State's climate goals and fostering interest and awareness of career pathways within this sector. Stakeholders may include local governments, local workforce development boards, boards of education, businesses, associations, and the public. In this way, an awareness and education campaign could be deployed on a local level, in targeted regions of the state and within specific communities, to foster broader understanding and interest in the Waste and Agriculture sector.

An awareness and education campaign could aim to build understanding of green job opportunities, skill requirements, and workforce pipelines. Data from Lightcast, specifically the Bureau of Labor Statistics, highlights that specific job opportunities within this sector include, but are not limited to, Refuse and Recyclable Material Collectors, Plant and System Operators, Hazardous Materials Removal Workers, and Operating Engineers & Other Equipment Operators, among others. These roles are a snapshot of the potential career pathways, with varied entry requirements, that could be pursued by individuals entering the workforce or those looking for a career change. For individuals interested in pursuing formal education and training in this sector, central New Jersey offers a notable concentration of learning opportunities, as seen in Figure 13.

Figure 13. Education Programs in the Waste and Agriculture sector in New Jersey



Highlighting this regional concentration in a locally driven awareness and education campaign could help promote targeted community outreach, refine messaging, and highlight accessible career onramps and pathways into the sector.

CCAP Sector 6: Natural Gas T&D sector

Workforce Development Strategy Category: Advance Locally Driven Career Awareness and Engagement Strategies; Encourage High-Touch Supportive and Wraparound Services

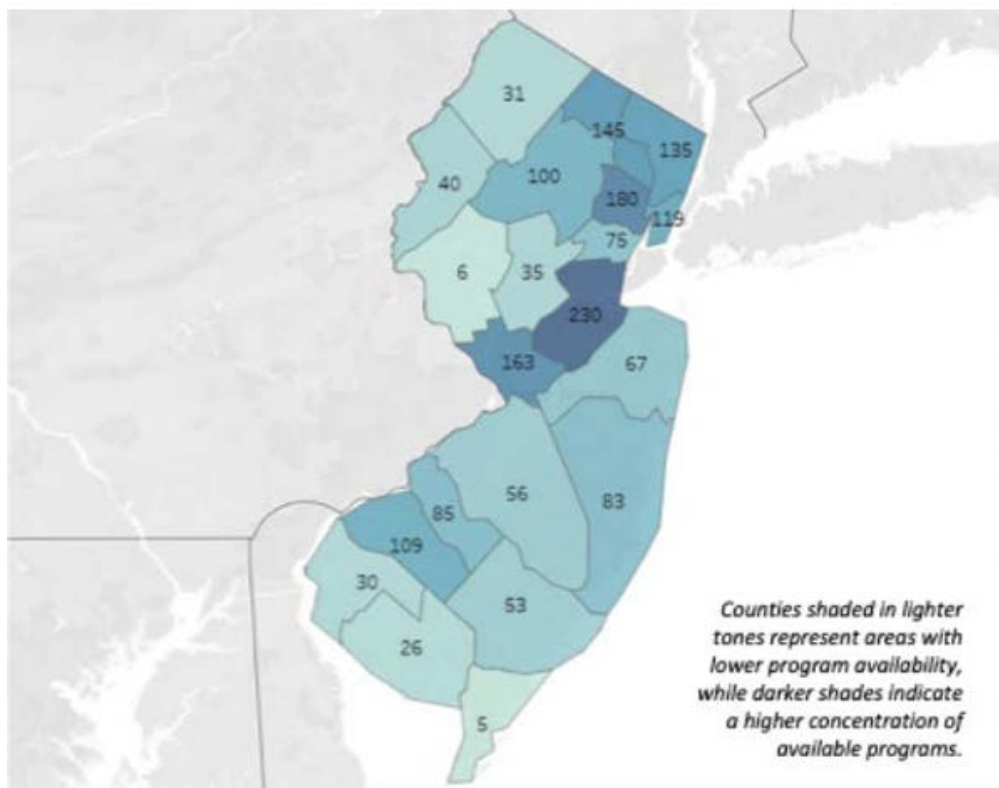
Develop targeted programming that leverages local community networks to promote career pathways while also instituting mechanisms for the provision of supportive services designed to reduce barriers to education and employment access.

The CCAP strategy for the Natural Gas T&D sector suggests an expansion of regulation to monitor natural gas emissions and the introduction of alternatives to traditional infrastructure developments. These CCAP measures highlight the growing need for a trained and skilled workforce able to support advancements in monitoring technologies and infrastructure development and/or construction practices within the sector. The labor market assessment of the Natural Gas T&D sector revealed that a majority of the workforce in this sector is male (91%), White (92%), and above the age of 45 (50%). These workforce demographics suggest the importance of diversifying the pipeline of workers entering the sector, with particular regard to creating and promoting opportunities for youth to engage in this sector as a significant portion of the current workforce approaches retirement. Additionally, the [inventory](#) of education and training programs in New Jersey showed that 27% are concentrated in the Natural Gas T&D sector, with most programs located in the central and northeast regions of the state, as seen in Figure 14. The availability of robust education and training opportunities suggests that there are pathways in place to enter this sector, but other barriers may persist that are keeping individuals

and/or certain communities from accessing these offerings. For this reason, there is a need to advance locally driven career awareness and engagement strategies in OBCs and diverse communities throughout the state, as well as offer supportive and wraparound services to reduce possible barriers to entry for education and employment in this sector.

NJDEP, working in conjunction with state and local partners, could advance an initiative that intentionally broadens the workforce pipeline for the Natural Gas T&D sector to engage OBCs and underserved populations, with a focus on fostering more equitable workforce inclusion and participation. Community-based organizations to consider for partnership include, but are not limited to, [United Way of New Jersey](#), [Isles, Inc.](#), and [Jewish Vocational Services of MetroWest](#). NJDEP could consider how to engage these established entities, building upon their expertise in delivering barrier and poverty reduction programming in their communities. Moreover, this initiative could consider how to incorporate supportive and wraparound services that aim to reduce common barriers to accessing education, training, and employment opportunities. Common barriers may include, but are not limited to, the cost of transportation and childcare. A program focused on barrier reduction could also feature supportive services programming, such as mentorship and job placement supports, which would effectively contribute to reducing barriers to entry and retention. Taken together, these high-touch interventions could promote sustained engagement and participation in education and career pathways within the Natural Gas T&D sector in New Jersey.

Figure 14. Education Programs in the Natural Gas T&D sector in New Jersey



CCAP Sector 7: Halogenated Gases sector (IPPU)

Workforce Development Strategy Category: Create Employer Engagement Networks; Connect Employers to Education

Work with employers and education providers to transition workforce training programs to support new technologies, such as low-global warming potential (GWP) refrigerant products.

The CCAP strategy for the Halogenated Gases sector (Industrial Processes and Product Use, or IPPU) includes implementing two programs - a refrigerant management program and a refrigerant replacement incentive program. By incentivizing the adoption of new technologies with refrigerant products, NJDEP will encourage action and drive demand. With that demand, there will also be a need for a trained and skilled workforce to support the maintenance and repair of these new technologies. In this way, existing workforce training programs should be adjusted and/or new programs created to support the maintenance of new technologies. Moreover, developing and updating education and training programs to be aligned with emerging technologies, specifically the manufacturing, installation, maintenance, and repair of low-GWP refrigerant and HVAC technologies, could be an area for critical future investment to ensure that the workforce is equipped with the relevant skills and competencies required to meet the evolving industry demands.

As education and training materials are updated to incorporate emerging technologies and advancements, NJDEP and other stakeholders could consider the ways in which to involve employers in this development process, working in collaboration with relevant educational institutions and training providers. Employers could offer valuable insights into the specific skills, tools, and competencies required for success on the job, thus allowing programs to be more aligned with workforce needs in real-time. This direct employer engagement could help the development and/or refinement of curricula to be responsive to changing industry demands, as well as improve the overall effectiveness and potentially positively impact the student outcomes from the education and training programs.

Moreover, NJDEP and other relevant stakeholders could foster and/or incentivize the creation of employer networks in the service of engagement with education institutions and training providers. Creating and/or utilizing existing employer engagement networks within this sector could support the creation of collaborative, ongoing feedback loops between employers and education. These employer-driven networks could support a regular dialogue between industry and education, which would serve to help refine training content and inform training and credential development. Furthermore, employer engagement in this way could also serve to validate that program graduates possess the skills necessary to be successful in relevant employment opportunities. In this way, this employer-centered collaborative approach could enhance job placement outcomes and foster greater alignment for the development of a robust talent pipeline within the Halogenated Gases sector (IPPU).

CCAP Sector 8: Natural and Working Lands – Carbon Sequestration sector

Workforce Development Strategy Category: Develop and Expand the Talent Pipeline; Advance Locally Driven Career Awareness and Engagement Strategies; Foster Engagement with State and Local Workforce Development Systems

Partner with relevant stakeholders to design and launch a federally registered apprenticeship program.

With anticipated growth for the Natural and Working Lands - Carbon Sequestration sector workforce (5%), as referenced in the labor market assessment of the Green Economy, there is a need to diversify and expand established on-ramps and career pathways into this CCAP sector for NJDEP. For this reason, NJDEP, working in coordination with other relevant stakeholders, could consider developing a federally registered apprenticeship program for this sector. A federally registered apprenticeship program offers an accessible on-ramp into employment in the Green Economy, as the apprenticeship model often includes lower barriers to entry, thereby making it particularly accessible for individuals in OBCs to consider. The benefits of a federally registered apprenticeship include, but are not limited to:

- ◇ A nationally recognized U.S. Department of Labor credential;
- ◇ Paid on-the-job training opportunities; and
- ◇ Structured progression into employment opportunities and advanced roles.

A federally registered apprenticeship would also support the State in advancing its goals set forth in NJDEP's report, [A Strategy to Advance Carbon Sequestration on New Jersey's Natural and Working Lands](#). This report puts forth targets for 2030 and 2050, across diverse domains, including forested land, wetlands, aquatic habitats, agricultural land, and developed land. The report calls for diverse entities, such as local governments, universities, nonprofits, private individuals, businesses, and industry partners,

to employ progressive land management practices, all of which will necessitate resources and workers for implementation (NJDEP, 2024).

For this reason, working in partnership with the NJDOL and relevant training providers in the state, NJDEP could also engage with the New Jersey Future Farmers of America (FFA) to collaboratively design and implement a federally registered apprenticeship program. A partnership that is rooted in community and locally driven, such as one with New Jersey Future Farmers of America and/or other community-based organizations, would help ensure that the development of a federally registered apprenticeship program is responsive to the needs of communities and residents, particularly those in OBCs, ensuring accessibility and awareness at the local level. The creation of a federally registered apprenticeship program would also provide for avenues of engagement with employment in this sector through the State's public workforce development system, specifically the Workforce Innovation and Opportunity Act (WIOA). WIOA focuses on registered apprenticeship opportunities as a key pathway to advance sector-based employment strategies, foster career pathways, and improve employment outcomes and credential attainment for program participants. This alignment with the public workforce system through a federally registered apprenticeship program would further allow for more diverse populations to gain entrance into training and employment within the Green Economy, specifically within the Natural and Working Lands - Carbon Sequestration sector .

Implications of Workforce Investments

The workforce development strategies outlined in the Workforce Planning Analysis are not an exhaustive list of potential interventions but rather offer an assessment of possible investments for the State to consider in the execution of the climate priorities outlined in the CCAP. As evidenced by the Heldrich Center's analysis, future targeted investment is needed to expand and ensure equitable access to education, training, and employment opportunities in the Green Economy, specifically for women and communities of color. These communities have historically been and continue to be left out of the employment opportunities stemming from the State's clean energy transition. The New Jersey Governor's Office of Climate Action and the Green Economy's [Growing Green Jobs](#) report further underscores this point by stating that the workforce in the Green Economy lacks gender balance, with little meaningful change in the workforce's demographics since 2021 (The New Jersey Governor's Office of Climate Action and the Green Economy, 2025). The report further states that the Green Economy has a high concentration of White workers, a critical finding for the workforce's composition that is also observed in the Heldrich Center's labor market analysis. By investing in targeted workforce supports to both broaden and foster the talent available to pursue and execute these climate priorities, the State, NJDEP, and other relevant stakeholders will be positioned to support the growth of New Jersey's Green Economy, with a particular expansion of opportunities for overburdened communities and historically underserved populations in the state.

The workforce development strategies are areas for potential future investment that are applicable to all industries in the Green Economy and the NJDEP CCAP sectors more broadly. These sector-specific workforce development strategies are proven means to bring greater alignment to sectors of the economy that may experience challenges in finding the skilled and trained workforce needed to meet employer needs. These sector-specific workforce development strategies address a range of workforce interventions, from developing a stronger talent pool and broadening career pathways and pipelines, to fostering greater alignment amongst relevant stakeholder groups within the sector and building a stronger community-based network to meet the rising demand for skilled workers in these growing sectors of focus. The workforce development strategies outlined in the CCAP are presented at the state level; however, depending on sector-specific application and corresponding stakeholder

buy-in, these interventions could be deployed on a more localized scale, such as at the county level, to account for regional differences in need.

Investing in and expanding green job career pathways will not only support progress toward New Jersey's clean energy and climate goals, but it will also serve as a catalyst for broad economic growth, workforce development, and social equity. Throughout this Workforce Planning Analysis, researchers have highlighted a need for high-quality, good jobs. This notion could be codified through the implementation of good quality standards, which are in alignment with the U.S. Department of Labor's [Good Job Principles](#). Although these principles, originally established in 2022, are no longer publicly available as of 2025, researchers recognize that the Good Jobs Principles provided a foundational framework for defining the key elements of a quality job. These included establishing standards related to recruitment and hiring, pay and benefits, job security and opportunities for career advancement, collective bargaining rights, and overall working conditions (USDOL, 2022). The principles also prioritized diverse job creation as a key way to expand access to good, stable jobs, particularly for populations from underserved communities (USDOL, 2022). Moreover, the aforementioned NJ Council on the Green Economy report notes that job quality standards can include, but are not limited to, prevailing wage standards, project labor and community workforce agreements, and support for unionization (NJ Council on the Green Economy, 2022). In coordination with other key state agencies, NJDEP is helping to create the conditions necessary for the growth of high-quality, good jobs within New Jersey's expanding Green Economy. Expanding employment opportunities in key sectors, such as those prioritized by NJDEP for the CCAP, further supports the development of career pathways to high-quality, family-sustaining jobs for residents across the state.

Underpinning the workforce development strategies outlined in this Workforce Planning Analysis is a need for stakeholder buy-in and partnership. Relevant stakeholders include, but are not limited to, sector employers, education and training providers, county and/or regional leadership, state leadership, community leaders, community-based organizations, community members, faith-based institutions, and other nonprofit entities. These workforce development strategies must be accepted and prioritized by stakeholders, in terms of both staff support and financial backing, to be made effective and result in the anticipated workforce benefits. Moreover, in advancing OBC inclusion in the Green Economy, relevant community-based organizations in New Jersey include, but are not limited to, [Ironbound Community Corporation](#), [New Jersey Work Environment Council](#), and [GreenFaith](#). These entities could be engaged in a collaborative dialogue about the needs of the communities that they serve, with particular emphasis on OBCs, to gain a deeper understanding of the priorities for these populations as they relate to programming and investments for climate mitigation and energy efficiency policies in the state.

The workforce development strategies and investments outlined in the CCAP, as well as those already underway in the state, help to build a more inclusive and resilient economy by prioritizing accessible career pathways for individuals from overburdened and historically underserved communities. These workforce development strategies also support the State's ongoing efforts to fulfill the strategies of the [2019 New Jersey Energy Master Plan Pathway to 2050](#), which specifically calls for the State to "support community energy planning and action with an emphasis on encouraging and supporting participation by low- and moderate-income and environmental justice communities" (State of New Jersey, 2020). As evidenced by the findings from the labor market assessment, the inventory of training and education providers, the maps of OBCs in the state, and the assessment of barriers for underserved communities, there is a need for targeted workforce development strategies, such as those outlined above, towards OBCs and/or historically underserved populations. Targeting these efforts within specific communities would ensure that diverse populations can participate in the prosperity derived from the emergence of the Green Economy and reap the benefits of the high-quality family-sustaining jobs this emerging sector will create in New Jersey. This also aligns with four key recommendations from the [Green Jobs For A Sustainable Future Report](#) (2022), specifically:

- ◇ Opportunity 1: Create green jobs that are also 'good jobs,' that offer family-sustaining wages and long-term career pathways;
- ◇ Opportunity 2: Maximize the benefits from green job growth in local and targeted communities, populations, and businesses; and
- ◇ Opportunity 4: Target workforce development initiatives to support a diverse pipeline of workers in filling current and future green employment opportunities.
- ◇ Opportunity 5: Focus on wraparound and comprehensive services and support for underserved communities to broaden the reach and positive impact of the green economy.²²

In advancing these core strategies and fulfilling the opportunities put forth by the NJ Council on the Green Economy, these workforce development strategies could bring more equitable access to opportunities for the entire workforce pipeline, ranging from career awareness for students enrolled in secondary learning institutions, to upskilling the existing workforce to ensure that no one is left behind in the transition to green jobs and green technologies. As such, there is a key opportunity to ensure that the benefits of clean energy and the burgeoning Green Economy in the state reach OBCs. Workforce opportunities for historically underserved populations and OBCs can take the form of education and training for in-demand jobs, paid learning opportunities, high-quality jobs, well-paying jobs, continued opportunities for professional development, and more. In this way, investment in fostering a more diverse, trained, and skilled workforce will help to ensure that historically underserved populations are an integral component of the workforce pipeline for the green jobs of the future in the state.

Conclusion

The Heldrich Center's multimodal research highlights the workforce development, training, and education landscape in New Jersey, with particular emphasis on key sectors and occupations of the Green Economy. NJDEP's CCAP identified sectors – Electricity Generation and Demand sector, Transportation sector, Residential & Commercial Buildings sector, Industrial sector, Waste and Agriculture sector, Natural Gas T&D sector, Halogenated Gases sector (IPPU), and Natural and Working Lands - Carbon Sequestration sector – are included in the State's planning and execution of the CCAP. The Workforce Planning Analysis for the CCAP offers critical insights to support the existing and future workforce underpinning these wide-ranging sectors' climate investments.

The Heldrich Center's Workforce Planning Analysis includes four critical components. First, the labor market assessment offers a foundational understanding of key workforce dynamics within NJDEP's eight CCAP sectors and the related priority occupations. Second, the inventory of education and training programs highlights the State's workforce capacity as well as the workforce development infrastructure in relation to OBCs. Third, the identification of barriers for underserved populations and OBCs highlights the complexities that these populations may experience when trying to access education, training, and employment opportunities in the Green Economy. Lastly, the development of sector-specific workforce development strategies, which build upon the quantitative data assessments and relevant literature, offers potential pathways to foster a more robust and inclusive workforce development ecosystem for education and employment opportunities in the Green Economy. This multimodal approach to the Workforce Planning Analysis offers a research-based assessment of NJDEP's eight CCAP sectors and the intended measures for the CCAP.

This work lays a critical foundation for the State's climate priorities and investments. Addressing any perceived or anticipated gaps in the workforce will ensure that a highly skilled pipeline of workers is trained and skilled for the high-quality jobs developed in clean energy in the coming years. Moreover,

²² https://www.nj.gov/governor/climateaction/documents/CGE_Roadmap.pdf

targeted engagement, recruitment, training, and hiring within OBCs will also ensure that a diverse workforce, comprised of underserved, disadvantaged, or historically overlooked populations, will be able to participate in the prosperity generated from the emerging Green Economy in New Jersey.

Future research can expand upon the workforce interventions most appropriate to support each measure within the eight sectors outlined in the CCAP to ensure that the benefits of clean energy extend to historically underserved communities and OBCs in New Jersey. A mixed-methods research approach, including quantitative data analysis and qualitative data collection, could elucidate the workforce impacts of each measure as they are put into practice. This future research could offer critical insight into the implementation of the State's climate investments and their perceived impacts on the workforce.

This Workforce Planning Analysis offers a pathway by which the State, NJDEP, and other relevant stakeholders can consider future investments in workforce initiatives as they relate to the State's burgeoning Green Economy. Investments in green jobs and a trained and skilled workforce able to assume those jobs will be critical in the coming years, as the sectors and occupations impacted by the introduction of and advancements to new technologies are predicted to increase. The Heldrich Center's research offers an approach to workforce planning that could be considered and expanded as future climate investments within the State of New Jersey come to fruition.

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