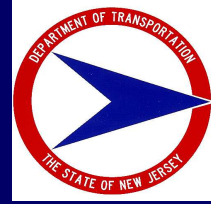


August 2010

NJ-2010-001

New Jersey Department of Transportation
Bureau of Research

Technical Brief



Incorporating Alternative Energy into NJDOT's Physical Plant

The New Jersey Department of Transportation (NJDOT) Division of Support Services is interested in exploring opportunities for generating renewable energy at NJDOT facilities (the Ewing Headquarters campus, the Newark Maintenance Yard, and the Mt. Arlington Regional Headquarters building). This study involved an analysis of energy costs and usage patterns, a survey of on-site renewable energy technologies, a focused technical memorandum on solar-generated electricity (called photovoltaics or PV), and an assessment of PV's potential and financial feasibility for several investment scenarios. The study concluded that solar photovoltaics may be well-suited for a variety of applications and facility types.

Background

NJDOT initiated this study in order to explore opportunities for reducing and stabilizing energy costs at its facilities and to demonstrate its commitment to environmentally friendly operations. Solar PV was emphasized over other technologies due to the ability to scale installations to fit a variety of sites and to take advantage of New Jersey's particularly favorable financial environment for solar energy generation.

Research Objectives and Approach

The objective of this research was to clarify the technical, financial, regulatory, and environmental feasibility of incorporating renewable, on-site energy infrastructure into three selected NJDOT facilities (the Ewing Headquarters campus, the Mt. Arlington Regional Headquarters, and the Newark Maintenance Yard). Seven site configurations were analyzed, with a crystalline silicon (panel) and thin film photovoltaic version for each – yielding 14 total scenarios (10 of which involve facilities at the Ewing Headquarters campus).

Three technical memoranda were produced to provide a firm foundation for the Final Report: An analysis of monthly utility data, with a focus on electricity, for the three selected sites; a summary scan of scalable, alternative energy technologies currently in use in the United States; and an overview of critical factors for PV project success, including power production and impacts, project implementation, zoning and permitting, state policy and planning, interconnection and net metering, and renewable energy incentives.

The Final Report outlines the methodology, inputs, and assumptions relating to power production, financial results, and greenhouse gas emissions, which were employed to generate results for each scenario using a standard benefit/cost spreadsheet model.

Findings

Any one of the scenarios may make sense for NJDOT, depending on circumstances and objectives. The following table summarizes the results, indicating potential first costs, yearly utility savings, years to payoff (discounted), estimated net present value (NPV) of each investment after 10 years, and greenhouse gas equivalent Car Years.¹

Description	First Cost	Yearly Utility	Pay Back	NPV 10 Years	Car Years (Rounded)
Ewing Thiokol Roof – Crystalline	\$682,061	\$32,478	6	\$284,928	21
Ewing Thiokol Roof – Thin Film	\$314,483	\$18,269	5	\$226,352	12
Ewing Thiokol Full Area – Crystalline	\$3,967,532	\$188,922	6	\$1,507,219	120
Ewing Thiokol Full Area – Thin Film	\$2,632,460	\$154,313	5	\$1,891,131	98
Ewing E&O – Crystalline	\$1,066,455	\$45,149	7	\$301,930	32
Ewing E&O – Thin Film	\$491,718	\$25,396	5	\$323,209	18
Ewing F&A – Crystalline	\$375,375	\$15,765	6	\$134,669	11
Ewing F&A – Thin Film	\$173,077	\$8,868	4	\$151,176	6
Newark – Crystalline	\$857,143	\$42,573	6	\$347,227	26
Newark – Thin Film	\$672,221	\$40,732	5	\$487,615	25
Mt Arlington – Crystalline	\$975,000	\$48,628	6	\$392,341	30
Mt Arlington – Thin Film	\$449,550	\$27,353	5	\$328,658	17

The Report recommends that NJDOT move forward by:

- Establishing expectations for financial returns, electricity costs, greenhouse gas impacts, and/or other criteria, depending on NJDOT's needs and resources.
- Coordinating with the NJ Office of Energy Savings (OES) in order to benefit from OES's statewide renewable energy activities, and
- Seeking implementation assistance, which may mean soliciting competitive bids from third-party solar developers for a Power Purchase Agreement.

For More Information Contact:

NJDOT Project Manager:	Vincent Nichnadowicz
	(609) 530-5963
	Vincent.Nichnadowicz@dot.state.nj.us
Principal Investigator:	Josh DeFlorio
	Cambridge Systematics
	(212) 209-6640
	jdeflorio@camsys.com

A final report is available on-line at: <http://www.state.nj.us/transportation/refdata/research/>.
If you would like a copy of the full report, send an e-mail to: Research.Bureau@dot.state.nj.us.

Incorporating Alternative Energy into NJDOT's Physical Plant NJDOT Research Report No: NJ-2010-001

¹ "Car Years" translates each scenario's greenhouse gas reductions to the removal of a quantity of passenger cars from New Jersey's roads for one year.