STATE OF NEW JERSEY

DEPARTMENT OF ENERGY

PRELIMINARY POLICY STATEMENT

SOLID WASTE: ITS ENERGY CONSERVATION AND PRODUCTION POTENTIAL

Prepared as part of the
development of the

ENERGY MASTER PLAN

MARCH, 1978

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I. PROBLEM STATEMENT

Solid waste collection and disposal practices are increasingly being recognized as environmentally damaging and wasteful of our precious energy, land and material resources. Once, solid waste was placed on the curb and then forgotten, once out of sight it was out of mind. Now, the magnitude of the problem is such that it can no longer be neglected. Over 17,000 tons of municipal solid waste are generated each day in New Jersey,[1] or enough to fill Giants Stadium every two weeks.[2] With a decreasing amount of land available to be used for landfilling purposes, this waste must be managed more efficiently and more effectively.

Continuing the present solid waste management system of landfilling valuable raw materials, has become an increasing concern because of the problems of our nation's balance of payments in international trade and dependence on foreign crude oil. For example, the U.S. Environmental Protection Agency (EPA) estimated that over 70% of this country's newsprint is manufactured in Canada which clearly undermines the economy.[3] By producing energy from solid waste, the State could help decrease our dependence on foreign oil. Landfilling raw materials is also an extremely wasteful mechanism in utilizing limited energy supplies since products produced from virgin materials require at least 60% more energy to produce than similar recycled products.[4] Although neglected in the past, these missed opportunities have a direct cost on the efficiency of our State's economy.

The waste of scarce land resources and environmental damage that results from many landfills is obvious; there are currently more than 300 landfills in New Jersey utilizing many thousands of acres of land. At an average assessed valuation of $3,700/acre, this amounts to approximately $50 million in inefficient utilization of scarce land resources.[5] Landfills have also been typically sited in New Jersey in areas that are environmentally sensitive, such as floodplains and wetlands. The leachate from these landfills are particularly damaging to these sensitive areas, often threatening the State's water supply. The EPA has indicated that ground water contamination is "practically impossible to eliminate with present means, and an acquifer may be ruled out as a source of drinking water for decades."[6]

1/ Sources at Department of Environmental Protection, Solid Waste Administration, Trenton, New Jersey
2/ Sources at Hackensack Meadowlands Development Commission
3/ Sources at U.S. Environmental Protection Agency, Office of Solid Waste Management, Washington, D.C.
4/ Resource Recovery and Source Reduction, First Report to Congress, U.S. Environmental Protection Agency, SW-118, February, 1974, p.8, Table 4.
5/ "New Jersey Landfills, Acreage and Assessed Value," Board of Public Utilities, Newark, New Jersey.
6/ Resource Recovery and Waste Reduction, Fourth Report to Congress. U.S. Environmental Protection Agency, S.W. 600, 1977, p3.

A dramatic example of this impact was seen recently in the area of Edison, New Jersey, where the Kim-Buc landfill was closed by the Department of Environmental Protection for continuous violations of their operating and design regulations. As the most densely populated state in the nation, other lands in New Jersey are too valuable to be used for unproductive landfill sites.

The reasons for the present system's plight are many. Until recently, technology was not available to recover the energy and material value from our solid waste. Now there are technologies that will transform the current liability of solid waste into useful energy and materials. However, the institutional and legal barriers to implementation of resource recovery programs have traditionally been formidable and the lack of resources provided to overcome these obstacles has been legendary. An historical perspective on recent efforts to address this problem will be the best mechanism to indicate how we developed our present approach to the problem and why the Department of Energy has recognized the need for strong state leadership to maximize the potential that our solid waste offers us.

II. BACKGROUND

In 1970, the New Jersey Legislature found in the Solid Waste Management Act that "the collection, disposal and utilization of solid waste is a matter of grave concern to all citizens. . . and that the current solid waste crisis should be resolved not only by the enforcement of more stringent and realistic regulations upon the solid waste industry, but also through the development of Statewide, regional, county and intercounty plans for solid waste management and guidelines to implement the plans."[7] In 1970, the New Jersey Legislature also found in the Solid Waste Utility Act that the "health, safety and welfare of the people of this State requires efficient and reasonable solid waste collection, disposal and utilization service [and] that such service will more likely be achieved if the Public Utility Commission is charged with the duty of setting and enforcing standards and rates for regulating economic aspects of solid waste collection, disposal and utilization service."[8]

Since 1970, the New Jersey Department of Environmental Protection (DEP) has been working to implement the Solid Waste Management Act and the New Jersey Board of Public Utilities (BPU) has been working to implement the Solid Waste Utility Act. However, by 1972 it became clear that something stronger was going to be required for the State to confront the serious solid waste problems it had. In 1972, the New Jersey County and Municipal Government Study Commission released its report entitled "Solid Waste: A Coordinated Approach." In this report, the Study Commission indicated that the solid waste crisis, recognized by the Legislature in 1970, had not improved but had indeed grown worse. The report further emphasized that one of the main obstacles to improvements in this area was the fractionalization of activity in solid waste management. In conclusion, the report recommended the enactment of legislation that would provide for a county solid waste management planning framework that would require each county in New Jersey to develop its own plans for implementing improved solid waste practices. This 1972 report resulted in the enactment of Chapter 326 of the Laws of 1975 which amended the 1970 Solid Waste Management Act, providing for such a planning process.

Under the provisions of Chapter 326, which became effective on July 29, 1977, each county in New Jersey and the Hackensack Meadowlands Development Commission are considered to be Solid Waste Management Districts.[9] These 22 Districts are divided into 3 groups which are to sequentially develop District plans within one year of the Act's

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7/N.J.S.A. 13:1E-2(a)

8/N.J.S.A. 48:13A-2

9/N.J.S.A. 13:1E-10

effective date for these groups. These District plans are to include a substantial amount of data defining the preset amount of solid waste flowing through the system and consider alternate methods of disposal, if practical and feasible. Chapter 326 requires that the plans include the "maximum practicable use of resource recovery."[10]

As the State was confronting solid waste problems through its Legislative activities, the Federal government recognized that more work needed to be done to upgrade "dumps" and that solid waste represents a potential source of solid fuel, oil or gas that can be converted into energy. In the Resource Conservation and Recovery Act of 1976 (RCRA), Congress found that the "need exists to develop alternative energy sources for public and private consumption in order to reduce our dependence on such sources as petroleum products, natural gas, nuclear and hydroelectric generation and . . . technology exists to produce usable energy from solid waste."[11] With the energy crisis of 1973 vividly in mind, Congress recognized that resources that could be utilized to meet our energy needs should not needlessly be discarded, particularly in a way that was also environmentally damaging.

Although the legislative processes of the State and Federal governments clearly recognized the problems and potentials of solid waste management in the above ways, the administrative response was less than adequate. At the Federal level, the Office of Solid Waste Management Programs was poorly funded and not given the resources to accomplish the lofty goals of the Resource Recovery Act of 1970 and RCRA. At the State level, the Bureau of Solid Waste Management was similarly poorly funded and was transferred from one Division in the DEP to another. Over the past seven years, that Bureau was located at different times in the Division of Environmental Quality, the Division of Water Resources and finally as a separate division-level organization entitled the Solid Waste Administration.

In 1974, the DEP Bureau of Solid Waste Management promulgated dramatically improved regulations governing the disposal of solid waste in the State. By 1977, the DEP began to enforce these regulations in a stringent manner that would begin to result in major upgrading of landfill facilities in the State. However, very little effort was made to develop alternate uses of solid waste in the form of source separation and resource recovery programs because of the low level of funding and staffing provided. With the effective date of Chapter 326 in July of 1977, the DEP had many legislated deadlines to meet

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10/ N.J.S.A. 13:1E-12 (b) (2)

11/ 42 U.S.C. 6901-1002 D (1976)

to comply with the statutory provisions and to regulate the existing facilities in the State. When combined with the development of a major new regulatory program that was mandated by RCRA for regulation of hazardous wastes, the DEP was not in a position to actively promote much needed resource recovery programs and was by no means in a position to offer assistance of any substantive nature to local governments struggling to overcome significant institutional, technical and financial obstacles to the successful development of such resource recovery activities.

In addition to these major problems, the DEP and the BPU since 1970 have not been able to find a common ground upon which solid waste regulatory issues could be established. Since 1970, the DEP has regulated the environmental aspects of solid waste management, and the PUC has regulated the economic aspects of the industry with little coordination of activities. This has become perhaps the most frustrating of all problems in the field of solid waste management in New Jersey today.

As the DEP confronted the major tasks of developing state and county plans for solid waste management, regulating hazardous wastes and existing landfills, and reviewing the environmental impacts of plans for new projects in the area of resource recovery, the New Jersey Department of Energy (DOE) was created to "coordinate authority, regulation and planning by the State in energy related matters."[12] The DOE was mandated to develop an Energy Master Plan that would address major issues confronting the State with regards to "production, distribution, consumption and conservation of energy."[13] In order to assure that this Master Plan was implemented, the legislature provided that all departments, agencies and instrumentalities of the State were to conform to the maximum extent feasible with the Energy Master Plan.[14] The DOE was directed to intervene in regulatory proceedings before other state agencies to ensure proper consideration of the Energy Master Plan and DOE regulations and rules.[15] In addition, the DOE was given coextensive jurisdiction with other state agencies to approve permits in the siting of such facilities.[16]

As the Congress of the United States had earlier recognized in RCRA, the new DOE recognized that significant amounts of energy could be conserved and produced from solid waste if managed effectively. Also, the DOE recognized that there had been an historical neglect

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12/N.J.S.A. 52:27F-2

13/N.J.S.A. 52:27F-12(a)

14/N.J.S.A. 52:27F-13B

15/N.J.S.A. 52:27F-13a

16/N.J.S.A. 52:27F-13c

of this field and that a bold new program designed to balance economic and environmental considerations by maximizing the energy conservation and production potential of solid waste would contribute significantly to progress in this area in New Jersey. Specifically, the DOE recognized that energy concerns could be a mechanism to elevate this problem from the shadows of the past and into the limelight as an opportunity for meeting our important energy goals. It is in this context that the rest of this Statement is being written, with the hopes that the energy potential that exists in our solid waste can finally be harnessed for productive use in the State.

III. ENERGY MASTER PLAN RECOMMENDATIONS

Solid waste must be looked upon not as an environmental burden, but as an opportunity for energy conservation and production. The State is beginning to be involved in recovering and recycling waste, but we must do much more. Generating more fuel, creating more jobs and preserving environmental quality can all be accomplished through aggressive resource recovery and recycling efforts. With that potential, the Department of Energy(DOE) will strive to make solid waste a significant component of the State's energy resources, as well as a new job-producing growth industry. By developing bold new results-oriented programs that will concentrate the development of this industry in existing urban areas, energy and materials recovery can contribute significantly to the State's goals of economic and urban revitalization.

To assure that the benefits, programs and policies of this Energy Master Plan are made a reality in this State, the DOE recommends that the following actions be taken.

A. CLEAR STATE POLICIES

To avoid past confusion and to provide the dynamic leadership that is required, the DOE should be the lead agency in all coordination, demonstration, development and regulation required to promote and establish resource recovery and source separation policies and programs. The role of the DEP should be to assure the preservation of environmental quality in solid waste management through concentration of its efforts in the enforcement of environmental regulations. The role of the BPU should be to assure that a rate structure is established which encourages the development of resource recovery and source separation programs. In this way, energy considerations in solid waste will balance economic and environmental policies and programs to ensure that the State maximizes the energy conservation and production potential from solid waste in a cost-effective, environmentally sound manner. This can be done through the implementation of the specific recommendations below.

B. ECONOMIC DEVELOPMENT AND URBAN GROWTH STRATEGY

Resource recovery projects should be sited in those areas where economic development opportunities and the creation of jobs are optimized. The concentration of this activity should be directed to urban areas, preferably integrated into industrial parks that provide lower-cost, stable energy as an attraction to entice new or existing industries to locate or expand in New Jersey. The DOE will encourage this concentration of activity in its review of programs and consideration of the "Need" for facilities as noted below. The proposed legislation to enable the Port Authority

of New York and New Jersey (PANYNJ) to develop and finance such industrial parks in northern New Jersey should be supported. Similar mechanisms should be developed for areas outside PANYNJ's district by expanding on the urban industrial park development programs of the Economic Development Authority or through other involved agencies. A goal of creating 16,000 jobs by 1988 should be established for such activity.[17]

C. ENVIRONMENTAL IMPROVEMENT

The DEP will need to establish standards, review environmental impacts of proposals and monitor results of energy and materials recovery programs to assure that the environment is preserved and that there are no deleterious effects from such development. In addition, an accelerated but judicious enforcement of the 1974 solid waste management regulations of the DEP, and extensive regulation of toxic, hazardous and carcinogenic wastes is necessary to protect New Jersey's valuable wetlands and upgrade the environmental quality of solid waste management in this State. Such a major undertaking will require the full attention of the DEP's Solid Waste Administration and, as previously stated, should be the major role of that agency in contributing to improved solid waste management.

D. ENERGY "NEED"

The DOE will, upon application from public and private sector developers and referral from other agencies, review specific projects to determine the "Need" for the project. It will promulgate regulations to reflect this process pursuant to N.J.S.A. 52:27F-13(c) which authorizes the Director of the Division of Energy Planning and Conservation to exercise coextensive jurisdiction with other State instrumentalities in the siting of energy facilities. Such a determination of "Need" will be based primarily upon a determination of whether the facility maximizes the energy conservation and production potential of solid waste in a cost effective manner while meeting all environmental standards.

E. ENERGY STRATEGIES

The DOE will identify, through review of the County and State solid waste planning process and other independent analyses, general priority geographic areas conducive to public and private sector investment in a phased development of solid waste energy conservation and production programs. These areas will be delineated in a broad state framework that will include locations and potential implementation timetables, as well as behavioral and cultural changes required to achieve a Conservation Ethic.

17/ See Appendix G of this Statement

The DOE will work for the development of regional resource recovery facilities through technical assistance and public information programs, as well as through support of the Chapter 326 planning process of the DEP, appropriate tax incentives and revisions in rate structures and regulations governing such activity. The Chapter 326 planning process should reflect this regional approach through the coordination and development of plans according to waste shed needs rather than relying solely on county boundaries. Tax incentives that should be supported include sales tax exemption for recycled materials and products to assist in stimulating demand and corporate tax credits for purchase of recycling equipment to stimulate investment. Rate structures for landfilling should be revised to reflect the greater costs of making mandatory environmental improvements. A consumer impact statement should be developed to determine the true costs to the homeowners of this increase, which at the present is projected to be approximately 10% of present costs of solid waste management. However, solid waste management rates should be restructured to encourage the conservation of waste resources through source separation recycling. Rates should favor homeowners who maintain stable costs for solid waste management through participation in source separation programs. State purchasing practices should be changed to assure that the highest percentage of products using recovered materials practicable are purchased by state agencies to stimulate market demand. In order to accomplish these and related objectives, the DOE should coordinate the disbursement of all monies obtained from the Federal government for state and local government assistance in the areas of resource recovery and source separation, including those monies obtained from the U.S. Environmental Protection Agency under the Resource Conservation and Recovery Act of 1976 for these purposes.[13]

F. UTILITY REGULATION

The Division of Energy Planning and Conservation (hereafter referred to as the Division) will develop and recommend policies governing landfill disposal rates in conjunction with the Board of Public Utilities (BPU) and the Department of Environmental Protection to determine how these rates should best be adjusted to contribute to energy conservation and resource recovery in this State. The Division will intervene before the BPU in appropriate hearings to strongly advocate policies that will assure that landfill rates properly reflect the costs of necessary environmental improvements. Such policies will be necessary before resource recovery will become economically viable. The Division will also encourage the participation of energy utilities in these programs by recommending policies to the BPU and intervening before the BPU to assure that reasonable participation is obtained.

13/ 42 U.S.C. 6943-4008

Permit programs regulating resource recovery must be streamlined and coordinated consistent with Executive Order #57 which directs that State Agencies act on permit applications within ninety (90) days of the permit application being declared complete by the individual agency.[19] An integrated permit process with uniform applications is necessary given the multitude of state permit programs that regulate these facilities.

G. WASTE FLOW

Development of resource recovery facilities and source separation programs will require a guaranteed flow of solid waste into such programs. In the past, the solid waste industry was unable to project future demands and anticipated revenues. This was partly due to the uncertainty of supply of the waste materials. Long-term commitment of these materials is necessary for the successful operation of resource recovery facilities. The Board of Public Utilities should utilize its statutory authority to establish franchises within waste shed areas and the Local Public Contracts Law should be revised to facilitate the development of contractual commitments by local governmental units.[20,21]

H. PUBLIC PARTICIPATION

The success of energy and material recovery development depends largely on the ability of the State agencies involved to obtain input from various sectors. A coalition must be built of all those who are interested in the development of this industry including labor, the solid waste industry, the secondary materials industry, the resource recovery industry, the investment community, environmentalists, consumer groups, and urban leaders. The public participation process must be construed in the broadest sense,including education of the general public and continued consultation and interaction with all interested parties.

19/ Executive Order No. 57, State of New Jersey, July, 1977.
20/ N.J.S.A. 48:13A-5
21/ N.J.S.A. 40A:11-1 et seq.

APPENDIX A

DOE LEGISLATIVE AUTHORITY RELATING TO ENERGY CONSERVATION AND PRODUCTION FROM SOLID WASTE

The DOE has the authority and responsibility to actively participate in the development and planning of resource recovery programs in New Jersey through the general powers "to coordinate authority, regulation and planning by the State in energy related matters," granted to the DOE by the Department of Energy Act.[22] The DOE is responsible for maximizing the energy production and conservation potential of commercial and demonstration resource recovery programs by virtue of the Act's directive to "design, implement and enforce a program for the conservation of energy in commercial, industrial and residential facilities."[23] The DOE is also responsible for resource recovery research projects and resource recovery educational programs that increase efficiency of energy use and promote energy conservation.[24,25].

In addition, since solid waste-based energy conservation and production systems can be considered energy facilities, the DOE has coextensive jurisdiction with other state agencies to approve permits in the siting of such facilities.[26] The DOE is also directed to intervene in regulatory proceedings before other state agencies to ensure consideration of the Energy Master Plan and DOE regulations and rules.[27] Furthermore, the Division has the authority to evaluate policies governing the establishment of rates and prices for energy and energy related matters, can make recommendations to the Board of Public Utilities, and can intervene before the BPU if necessary to ensure that changes will allow citizens, utilities and industry to move towards greater resource recovery from solid wastes.[28] To advance these and related activities, the DOE has the authority to construct and operate experimental or demonstration solid waste facilities.[29]

22/ N.J.S.A. 52:27F-2
23/ N.J.S.A. 52:27F-9g
24/ N.J.S.A. 52:27F-9h
25/ N.J.S.A. 52:27F-9j
26/ N.J.S.A. 52:27F-13c
27/ N.J.S.A. 52:27F-13a
28/ N.J.S.A. 52:27F-9i
29/ N.J.S.A. 52:27F-9w

APPENDIX B

BENEFITS OF ENERGY CONSERVATION AND PRODUCTION FROM SOLID WASTE

To maximize the potential of resource recovery programs, the State should take advantage of all aspects of these programs. By taking a broad perspective the state will not only conserve and produce energy from solid waste but also improve the environment and contribute to much needed economic development.

A. Energy Production

Technology is capable of converting solid waste through resource recovery facilities into reuseable materials, valuable fuels, and ultimately, energy which will assist in meeting the state's needs for limited fossil fuels. DEP Commissioner Rocco Ricci has stated, "If combustible solid wastes were converted into a simple, dry, refuse-derived fuel (RDF), there would be a total BTU value of 115 billion BTU's per day, . . If all of our [municipal solid] wastes would be converted to RDF, therefore, we could expect them to produce approximately 5 billion kilowatt hours of electricity per year."[30] This could provide the equivalent of the entire electrical energy needs for over 830,000 average homeowners in New Jersey for an entire year or almost all the residential electrical needs of Bergen, Essex and Hudson counties.[31] Many industrial plants could generate at least half the process steam they use from energy derived from solid waste.[32]

B. Energy Conservation

The production of fuels and energy can provide significant savings which can be made through the reuse of recovered materials instead of virgin materials. For example, use of:

- repulped wastepaper can save more than 60% of the energy needed to produce paper products when compared to virgin materials;
- waste iron can save more than 70% of the energy used in producing new steel; and
- waste aluminum can save more than 95% of the energy used in producing aluminum products, when compared to the use of virgin materials.[33]

30/ Testimony of Commissioner Rocco Ricci, Energy Master Plan, Public Hearing, September 26, 1977, Atlantic City, New Jersey

31/ See Appendix E of this Statement.

32/ Ibid

33/ See Appendix F of this Statement.

The energy savings achieved through such material recovery would result in approximately 75% of the amount of energy that can be produced from solid wastes.[34,35] Simply stated, this energy savings could provide the entire electrical energy needs for over 612,000 average homeowners in N.J. for an entire year, or almost all the residential electrical needs of Atlantic, Burlington, Camden, Middlesex and Monmouth Counties.[36] Therefore, when combined with the amount of energy produced from solid waste, almost 61% of the housing units of the state could be serviced as noted by this quantity of energy conserved and produced.[37]

C. Economic Development

Resource recovery has a human dimension. Resource recovery can be used as a tool for economic development with large scale investment by the private sector bringing ratables and major employment opportunities to the areas where such facilities are located. In Newark, for example, the investment of $70 million in a solid waste facility by a major resource recovery firm primarily producing energy will create over 500 construction jobs and 100 operating jobs as well as the ratables associated with such an investment.[38]

The establishment of such solid waste disposal systems will also result in the creation of new sources of raw materials, which can encourage manufacturing industries to locate adjacent to facility sites. As the Port Authority of New York and New Jersey has suggested, solid waste-based industrial parks can be developed, where the recovered materials and energy will become the inputs to manufacturing processes.[39] An example of this is glass recovered from resource recovery facilities which could be used to make glass sewer pipe, or to produce new bottles, terrazzo tiles, or glass wool insulation. Also, paper recovered from these facilities could be utilized as backing for glass wool insulation (or other construction materials).

The use of energy recovered from solid waste facilities can also be an economic development tool and as such, can be used to ease unemployment. Energy produced from solid waste produced at a low cost and guaranteed over a long period of time could be an incentive for attracting industry to locate in New Jersey. The Port Authority estimates that 30% of the costs of energy for a typical medium-sized

34/ See Appendix E of this Statement
35/ Ibid.
36/ Ibid.
37/ Ibid.
38/ "Newark - Resource Recovery Program," Office of Environmental Services, Department of Engineering, City Hall, Newark, New Jersey
39/ Industrial Recycling Parks: Opportunity for Regional Economic Growth, Port Authority of New York and New Jersey, June 1973

industry which consumes a moderate amount of electricity could be saved if solid wastes are used to generate that energy in an integrated industrial park.[40] For existing facilities, the use of solid waste fuels to supplement present fossil fuels, with minor modifications of industrial boilers in existing facilities may assist in stabilizing industrial fuel prices, hence contributing to industries' decisions to remain in New Jersey.

D. Environment

An important consideration in the development of improved solid waste disposal systems is the need to conserve land and natural resources while upgrading environmental quality. Resource recovery programs would enable the state to dramatically reduce the amount of water pollution resulting from leachate, air pollution associated with smoldering dumps, and the amount of biologically productive land needlessly consumed by landfilling. Stringent DEP regulations promise to result in a dramatic improvement in landfill facilities over the next decade.

40/ Ibid

APPENDIX C

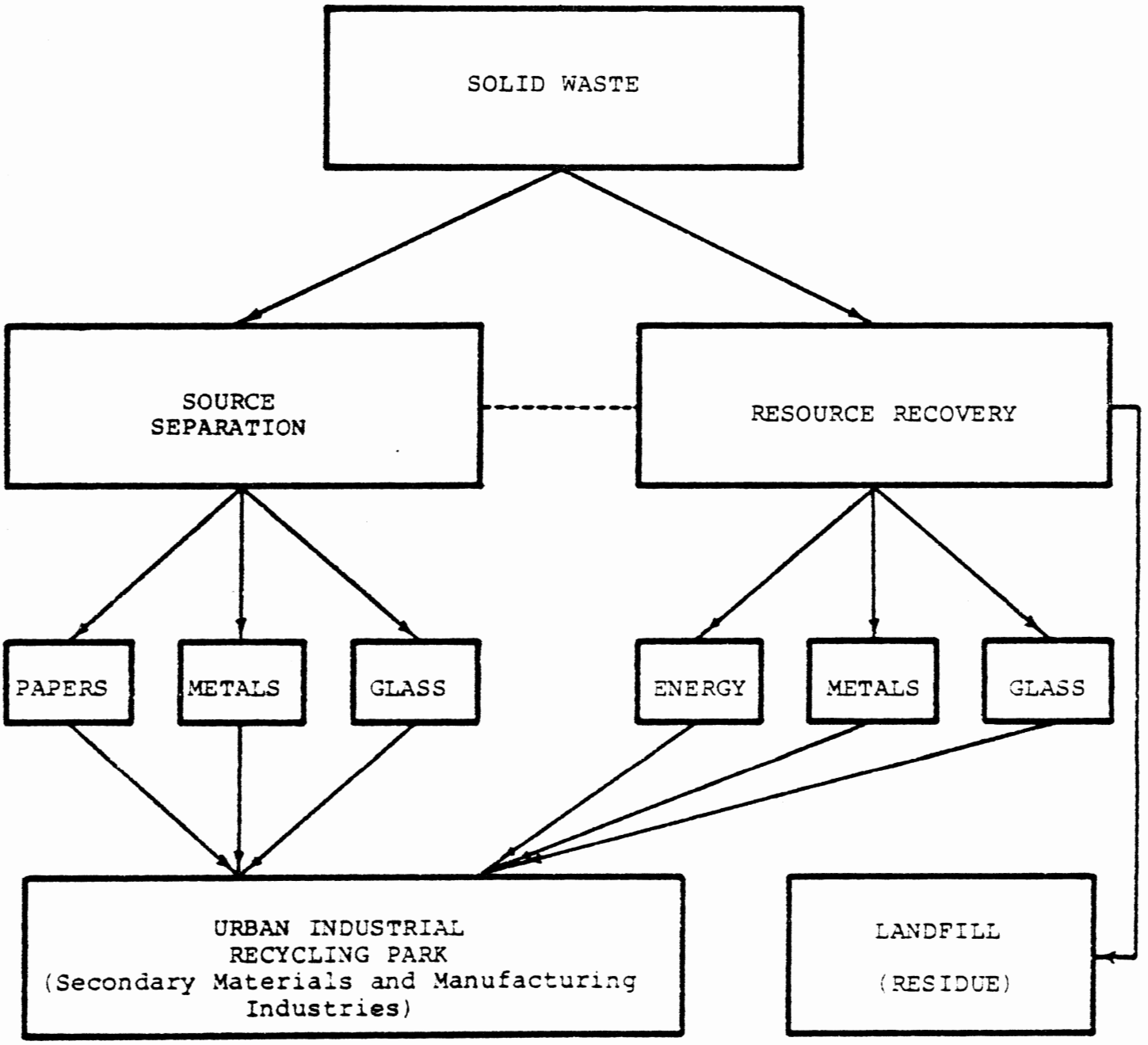
ENERGY CONSERVATION and PRODUCTION PROGRAMS BASED ON SOLID WASTE

There are essentially four elements of energy conservation and production programs based on solid waste: Waste Reduction; Source Separation; Resource Recovery; and Landfilling (See Figure 1). Waste Reduction programs include the levying of product charges and other efforts to decrease the amount of solid waste generated. As most waste reduction programs are oriented to major adjustments in the structure of the marketplace, these programs require federal direction and initiatives to have an impact, and subsequently are not discussed further in this Statement. Source Separation recycling programs are based on the separation of materials at their source of generation (e.g. the home or office) into components that can be upgraded and recycled to manufacturing facilities to be used as raw materials in the production of new products. Generally, these programs recover different grades of paper, tin, iron and aluminum, and various colors of glass. Resource Recovery facilities are major capital intensive mechanical separation operations which sort mixed solid wastes into component parts suitable for recycling. Resource recovery facilities produce energy such as steam, oil, gas or solid (often referred to as RDF-Refuse Derived Fuel) fuels through shredding and air classifying, pyrolysis or waterwall thermal processing systems. Resource recovery facilities can also reclaim materials such as glass, iron, aluminum, paper and compost, depending on the nature of the facility design.

The fourth element is Landfilling. Landfills provide for the final disposal of residues and unmanageable wastes. When properly designed and operated, landfills are an important element in the success of any balanced, integrated solid waste program.

FIGURE 1

THE SOLID WASTE CYCLE



A. Source Separation

Residential source separation programs range from voluntary centers run by dedicated civic associations to curbside multi-material collection programs operated by municipalities or private solid waste collectors. Office source separation programs usually include recycling receptacles on desks or in convenient locations which office maintenance workers collect for recycling.

Source separation programs require little capital and minimal technological modifications from present solid waste collection practices and are therefore relatively easy to start when compared to the complexities of resource recovery facilities. Because of the low cost of entry, the most critical factor in the success of these programs is the education of the public as to the requirements of the Conservation Ethic and the cultural and behavorial changes that are the necessary result of such educational programs. The DOE strongly believes that these programs can make an important contribution to the State's overall efforts to conserve energy. The DOE has established a goal of 20% of the municipal solid waste stream to be separated with aggressive leadership in the development of such programs. As these programs rely tremendously on local initiatives, the DOE will promote source separation through support of these initiatives and economic incentives and differential rate structures as noted in Section VII of this Statement.

The on-going success of source separation programs will also make possible the expansion and further development of intermediate processing centers. These centers centralize the collection functions, upgrade the quality of source separated materials and obtain better market prices for sale of such materials through economies of scale.

Such centers provide further business opportunities, especially for small, self-reliant businesses, and contribute to the overall economic development potential of solid waste in general.

B. Resource Recovery

Resource recovery facilities can vary in size from intermediate scale 200 TPD (tons per day) systems as in Ames, Iowa, to 3000 TPD systems as will be built in Dade County, Florida. New advances in the technology suggest a potential trend towards development of intermediate scale energy recovery facilities in conjunction with industries which require a stable source of energy for their operations. Such intermediate scale development may provide a lower cost of entry into resource recovery and fewer

institutional problems than larger scale facilities, if they prove to be cost effective. This intermediate scale also has the potential added advantage of concentrating the energy benefits in markets where the value is maximized for economic development.

Large scale centralized resource recovery facilities provide other opportunities and potential benefits. District heating and cooling systems could be developed and fueled by solid waste, as in Nashville, Tennessee, and many European communities. Industrial parks could be developed based on the stable, low-cost energy provided by a large scale energy recovery facility. Both of these approaches would concentrate the benefits of energy production from solid waste in such a way as to be a useful tool in stabilizing New Jersey's economy.

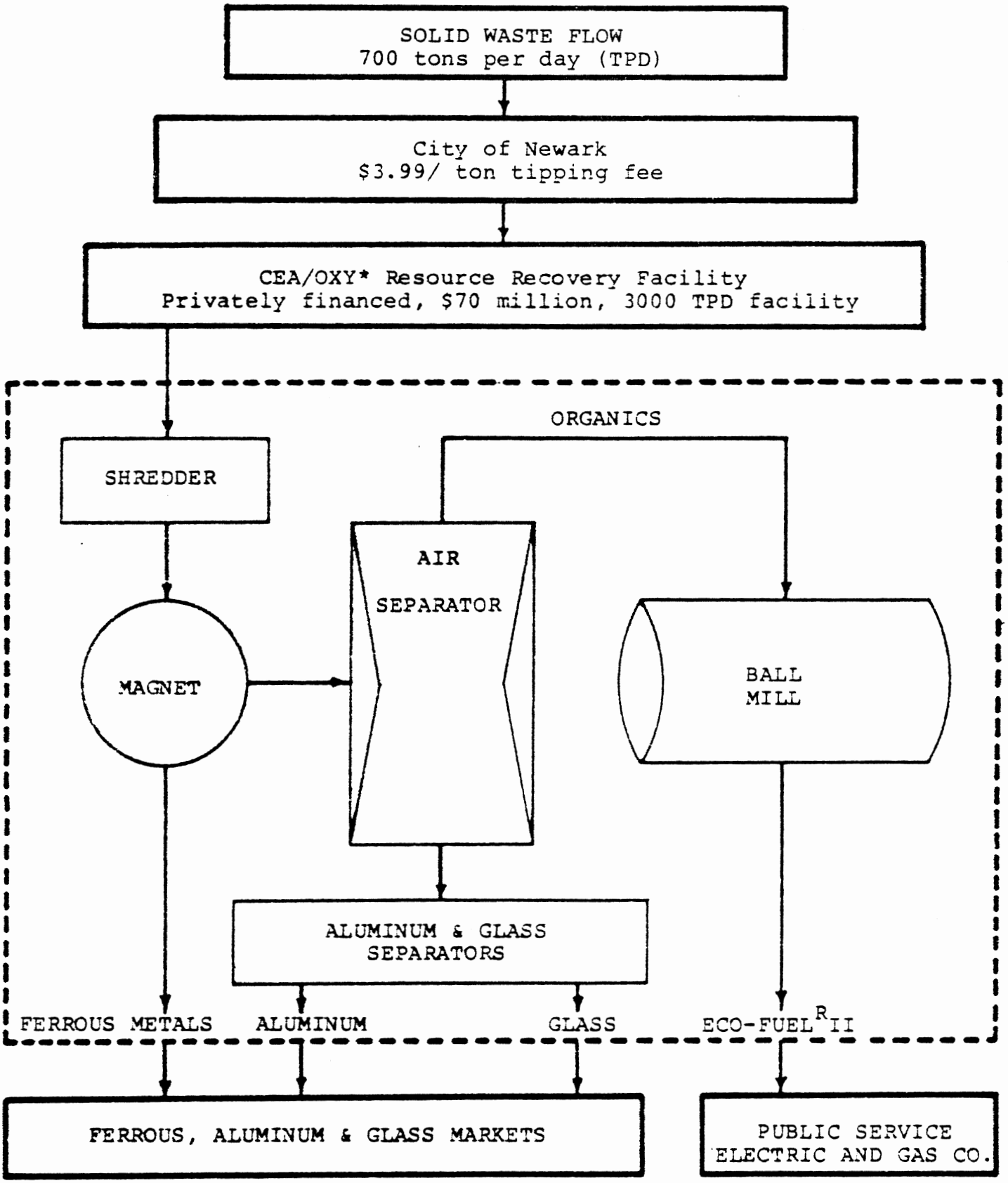
Many large scale facilities have the added advantage of producing sufficient fuel for a diversity of markets. Although many large scale facilities have been based on sale of fuel to local utilities to date, there appear to be significant advantages of selling refuse-derived fuels to a variety of local industries. By broadening the market in this way, resource recovery facilities may become more stable and cost effective.

As discussed above, Newark has entered into a contract which will result in the construction of an energy producing facility that will sell its solid fuel to Public Service Electric & Gas Company, to supplement P.S.E.& G's fossil fuel supply needs (see Fig.2). The Newark facility will be the first on-going commercial operation using reclaimed solid waste as an energy source in New Jersey. The progressive support of Public Service in the development of the project was instrumental in its success to date and provides a model for other programs in the state to follow. Such a union of the public and private sectors can provide the mechanism for maximizing the benefits of resource recovery development in the state. Also, in this state, a progressive phased approach to the development of resource recovery has been undertaken by the Monmouth County Board of Freeholders. In addition, the Hackensack Meadowlands Development Commission is also developing plans to construct an energy producing resource recovery facility in the Meadowlands.

C. Urban Industrial Recycling Parks

As noted above, by concentrating the energy and materials produced from resource recovery facilities in a given area, there

FIGURE 2 - NEWARK RESOURCE RECOVERY PROGRAM



* CEA/OXY Resource Recovery Associates is a joint venture of Combustion Equipment Associates and Occidental Petroleum Corporation

is a great economic development potential created. Industries could be attracted either individually or clustered in an integrated industrial park framework which would directly use the energy and materials from resource recovery to produce new products and services. This opportunity could reshape the structure of industry, by altering its patterns of location and distribution to reflect these new sources of energy and materials. Resource-oriented industries would move or develop new facilities in metropolitan centers rather than continue to locate near mines or forests. [41] This would have the additional energy conservation benefits of decreasing the amount of transportation of raw materials and finished products necessary for the entire production cycle.

This development of industrial recycling parks in urban areas is consistent with many other goals of the state. Urban revitalization is a high priority of the state government and resource recovery, if used effectively and creatively, can become a significant economic development tool to assist in meeting this important goal. By coupling the employment opportunities inherent in resource recovery with siting of these facilities in urban areas, unemployment will be eased in those areas where the incidence of unemployment is the greatest. In addition, there are many advantages to locating resource recovery facilities in urban areas which include the scarcity of land available for landfilling, the large supply of solid wastes, and existing markets for materials and energy recovered from solid waste.

Industries that could potentially be located in an industrial recycling park include, but are not limited to:

- Insulation product manufacturers (particularly useful for energy conservation needs);
- Detinning plants;
- Mini-Steel mill;
- High value chemical product producers;
- Building material businesses such as terazzo tiles. wall boards;

41/ Industrial Recycling Parks: Opportunity for Regional Economic Growth, Port Authority of New York and New Jersey, June 1973

- o Non-ferrous smelters; and
- o Primary industries of innovative forms based on new product development activities.[42]

An example of a new product that could be made from recycled materials and which could potentially provide tremendous benefits to New Jersey's economy is glass pipe. Preliminary experiments with this type of pipe have shown that it is stronger than many existing types of pipes and is highly resistant to corrosion from acids or high velocity and high volume water supplies. As a result, this pipe may be extremely useful in meeting our sewerage needs and other piping needs legislated under the 1972 Federal Water Pollution Control Act Amendments and the 1976 Safe Drinking Water Act. A section of 15 feet was installed in the sewers of Newark in 1976 to test the capabilities of this pipe in an industrialized area.

The glass industry would also benefit tremendously from the use of glass recovered from resource recovery facilities and source separation programs. In recent years, the glass industry in New Jersey was confronted with major efforts to clean up its air emissions under New Jersey's strong air pollution control program. As a result, the glass manufacturers had to decrease their furnace temperatures in such a way that they reduced the capacity of materials flowing through their facilities by 25%. As recovered glass can be processed at lower furnace temperatures than virgin materials, the glass industry potentially could regain that lost capacity through increasing its utilization of waste glass cullet, and simultaneously conserve our precious natural gas resources.[43]

D. Secondary Programs

Properly designed sanitary landfills can also be sources of energy. According to recent test results, the methane gas generated by the decomposition of organic matter in these sites may be harnessed for use by private and public facilities.[44]

Sewage sludge can also be utilized as a material or energy resource when disposed of in conjunction with solid waste (codisposal). Although only in the demonstration phases, facilities have been designed to either produce compost or energy products such as methane gas. New concepts in energy conservation such as the compost facility for sewage sludge in Camden County will be the basis for further exploration of the potential of codisposal.

Waste oil from automobile crank cases can also be a source of energy and valuable oil if recovered from automobile owners when the oil is changed. Programs can be established to collect this oil at gas stations and reinspection stations which will concentrate the quantities sufficiently to be of economic value.

42/ Ibid.
43/ Industry Sources
44/ Ibid.

APPENDIX D

POLICIES AFFECTING ENERGY CONSERVATION AND PRODUCTION FROM SOLID WASTE

A. Energy Conservation

Although many question our ability to change our lifestyles from a disposable, wasteful society, the importance of such a change from an energy perspective is obvious. This will require an aggressive effort to solicit public support for energy conservation. Source separation programs and materials recovered from resource recovery facilities can make a significant contribution to such energy conservation. Also, source separation programs have fewer institutional and financial barriers to their development than resource recovery facilities, largely due to the fact that they can be economically successful in smaller areas than those required to supply resource recovery facilities. This suggests that if the behavorial issues can be addressed in an enlightened manner and the public responds positively, source separation programs could be achieved relatively quickly and provide an alternative to landfilling for up to an average of 20% of the solid waste stream.[45] This would assist in bridging the gap from today's landfill emphasis to the balanced solid waste disposal programs that are the goal of this Statement. This would also provide an opportunity for low-cost capital entry into resource recovery by existing private industry.

To achieve successful source separation programs, a climate conducive to such activity must be established. Such a climate could principally be established through economic incentives. Economic incentives would include revision of rate structures for solid waste collection filed with the Board of Public Utilities to have different rates for those who participate in source separation programs and those who do not. Homeowners who participate, for example, would pay less for solid waste collection because the collector would not have to haul and dispose of the recyclable portion of the solid waste stream. Similar benefits should be derived from participating solid waste collectors and markets receiving these materials. Other incentives include:

1. Publicizing availability of markets with long-term contracts and guaranteed base prices provided by secondary material industries. These are presently available for up to 20% of the municipal solid waste stream;

45/ Resource Conservation and Recovery Associates, Inc., Saddle Brook, New Jersey.

2. Integrating government actions to establish clear state policies and procedures which will introduce greater certainty for effective business planning;

3. Assisting with equipment and container financing through tax incentives for collectors and homeowners;

4. Assisting in integrating collection systems and municipal needs to assure proper waste control and flow of solid wastes;

5. Standardizing quality control for source separated materials to meet agreed upon product specifications;

6. Supporting, expanding and demonstrating the development of intermediate processing centers; and

7. Developing educational programs to communicate the importance of such programs and how to participate.

B. Energy Production

Although the development of resource recovery facilities that produce energy is a complex process that often takes several years to accomplish there are essentially four critical obstacles that must be overcome to encourage this type of activity in the state, as follows:

- The absence of long-term markets for materials and energy recovered from resource recovery facilities;
- The unclear and fragmented control of waste;
- Sole reliance on landfills and undervaluation of land and waste as resources; and
- Financial and institutional barriers.

1. Market Development

Initially, markets for resource recovery facilities will stress the energy products that can be produced. Large stable markets will be required for financing resource recovery facilities that will be able to contract for the life of such facilities. Nationally, this has resulted in a trend to work with large utilities to supplement their fossil fuels with a stable, low-sulfur energy source derived from solid waste. Since rate structures, policies and regulations established by the Board of Public Utilities in N.J. direct the extent of utility involvement in the use of resource recovery energy, these should be revised to reflect the new policies of the state to utilize solid wastes as an energy resource.

Once resource recovery facilities have begun operating in N.J., these facilities will demonstrate the benefits of using their energy products to large and small industrial customers. Since not all fossil fuel systems in the state can utilize energy derived from solid waste, an analysis must be made of which fossil fuel systems in the state could be altered and what new facilities can be encouraged to use this source of energy. Financial incentives to encourage such participation should be explored, including the potential support of the state in guaranteeing projects to enable them to obtain private financing.

2. Waste Streams

A guaranteed daily flow of waste materials into resource recovery facilities is necessary to assure a continued flow of energy and material outputs from these facilities. Such a waste stream can be guaranteed only by the generators of the solid wastes. Thus, in order to assure the necessary supply of waste to make resource recovery economically viable (approximately 500-1000 tons per day) either franchises must be authorized or municipalities should contract for the resource recovery service with an appropriate public or private entity. This guaranteed flow should be designed to provide for both source separation and resource recovery facilities to be developed on an integrated basis. The planning process presently underway by the Department of Environmental Protection (pursuant to Ch. 326, P.L. 1975), could provide the framework for the development of such interlocal and regional agreements.

Regional agreements should be made wherever possible according to parameters of waste sheds. Waste sheds are defined by a variety of factors which impact on the cost effectiveness of the system. These factors include, but are not limited to: traffic patterns; existing patterns of waste flow; topography; population densities; waste generation rates; existing materials and energy markets; availability of alternate transportation modes; and availability of sites for resource recovery and final disposal. Inherent in such a system design would be the optimization of the efficiency and minimization of costs to all participants in the system. This is preferred over a strictly county orientation for determining proper waste flow and system design, although counties can be the vehicle for developing such waste sheds through the implementation of Chapter 326.

3. Rate Structure

A major obstacle to resource recovery programs has been the present low level of landfill disposal rates in this state which makes it difficult for resource recovery facilities to be economically

competitive. Whereas landfill rates are approximately $10 or more per ton in neighboring New York, rates in New Jersey are approximately $3 per ton.[46] Not only have these low rates dramatically reduced the economic incentives to develop resource recovery facilities, but this economic differential has exacerbated New Jersey's solid waste problem by acting as a magnet to attract solid wastes from surrounding states in increasing quantities. This continues the spiraling waste of our important natural resources used to produce the discarded materials.

Energy conservation and production considerations should determine the future use of our waste resources. Procedures used to establish present landfill rates must be evaluated to reflect these considerations and to assure that the long-term goals embodied in this statement are integrated with rates and regulations affecting the solid waste industry. Rates structured to reflect the costs of sanitary landfill capital costs with mandatory environmental equipment are necessary to establish rates designed to improve this method of disposal.

4. Financial/Institutional Obstacles

Another obstacle to resource recovery development is the institutional and financial framework in which programs are developed. With the implementation of Ch. 326 solid waste planning by the Department of Environmental Protection, the state has the opportunity to organize its solid waste planning activities into a cohesive, comprehensive and effective structure that will stimulate resource recovery development on a regional basis. This process has the potential of integrating the various persons and groups who have an interest in some aspect of solid waste disposal by establishing a consensus on the direction to be taken in the state.

Financing requirements for resource recovery facilities can range from $25-100 million, depending on the size of facility and type of process. Raising such large amounts of capital requires rigorous analysis of financing options and utilization of the most cost effective approach in a given area. Public financing of facilities offers tax advantages, relatively short lead time for capital formation and the ability to spread the costs and benefits of a project according to predetermined social policy goals. Private financing is advantageous because it takes the burden of financing off the public sector so that debt is not considered as part of the calculation of municipal debts. Also, private financing can accelerate some projects, depending on the inherent soundness of the project and the company. Analysis must be done to determine when public or private financing should be used in particular situations, and where a combination of approaches might be appropriate.

46/ Solid Waste Industry Council Sources

5. Technological/Economic Policies

Technological and economic policies must be clearly established to facilitate successful development of resource recovery facilities. Facilities should be constructed:

- To reflect the needs of a particular waste shed including a balance of resource recovery, source separation and final disposal (e.g. in methane producing landfills) taking into account the most appropriate technological options available;
- To use the most flexible technology, in order to provide for changes in this rapidly evolving field and in the waste stream and to minimize the risks involved in design;
- To maximize the energy, economic and environmental benefits through codisposal with sludge as well as integration of facilities with secondary material industries in industrial recycling parks; and
- To aid in the state's efforts to save the inner cities by providing a new industry as part of the economic base.

Economic policies could be established through the Energy Master Plan that will:

- Stabilize markets for materials and energy recovered;
- Minimize the risks in development (e.g. by providing back-up energy sources and energy markets for fluctuations in materials flow);
- Provide incentives for investment in resource recovery facilities;
- Develop markets through increased utilization of recycled materials in state controlled projects. (e.g. the Department of Environmental Protection could require that glass sewer pipes be used in a portion of the sewers constructed through their construction grants program and the Department of Energy could require that the insulation used in programs regulated or directed by DOE be produced from recovered pulp and glass wool); and,
- Adopt a Conservation Ethic which recognizes our material and energy scarcity and provides an economic rationale for resource recovery development.

APPENDIX E

ENERGY IMPACT OF RECYCLING NEW JERSEY'S MUNICIPAL SOLID WASTE

I. ENERGY PRODUCTION VALUE:

A. Total Municipal Solid Waste (MSW) Generated = 6.2 million tons per year.

Refused derived fuel (RDF) Value of MSW = 5 billion kilowatt hours per year.[47]

Electrical Consumption of Average Household = 6,000 kilowatt hours per year[48]

B. Energy Production / Consumption = Household deriving electrical energy needs from RDF

$$\frac{5{,}000{,}000{,}000 \text{ kw-hrs/year}}{6{,}000 \text{ kw-hrs/year}} = 830{,}000 \text{ households}$$

C.

Counties	All Year-Around Housing Units[49]
Bergen	283,575
Essex	311,566
Hudson	214,665
TOTAL	809,806

D. Conclusion:

The RDF Value of New Jersey's municipal solid waste is sufficient to supply the average electrical energy needs of homeowners in Bergen, Essex, and Hudson Countiies.

47/ Testimony of Rocco Ricci, Commissioner of the New Jersey Department of Environmental Protection, Energy Master Plan, Public Hearing, September 26, 1977 Atlantic City, N.J.

48/ Electrical consumption records of the New Jersey Board of Public Utilities.

49/ 1970 Census of Housing, U.S. Dept. of Commerce, Bureau of Census.

II. ENERGY CONSERVATION VALUE:

A. An average family produces about two tons of MSW per year. If the materials in two tons of MSW were recycled, the potential energy savings through resource recovery are calculated as follows:[50]

- The user of the recovered steel would save 5,400,000 BTU's in the manufacture of the new metal;
- The user of the recovered aluminum would save 200,000 BTU's in the manufacture of the new metal;
- The user of the recovered glass would save 300,000 BTU's in the manufacture of new containers;
- The country would save additional energy and resources by not having to extract the equivalent amounts of raw materials and fuel to process and transport the raw materials;
- The local community would receive 8,000,000 BTU's of a new, low-sulfur fuel; and
- The local community would save four cubic yards of landfill space and avoid the formation of leachate and other environmental problems.

B. Energy Conservation in BTU's through ultilization of recovered materials = Total energy conserved

$$5{,}400{,}000 + 200{,}000 + 300{,}000 = 5{,}900{,}000 \text{ BTU's}$$

C. $$\frac{\text{Ratio of Energy Conservation}}{\text{Energy Production}} = \frac{5{,}900{,}000}{8{,}000{,}000} = .7375 = 74\%$$

50/ "Resource Recovery from Municipal Solid Waste. An Appraisal," National Center for Resource Recovery Bulletin, Spring 1977, p.33.

D. Housing Units Served by Energy production X Energy Conservation ratio = Housing units deriving equivalent of entire average electrical energy needs.

830,000 X .7375 = 612,125

E.

Counties	All year-Around Housing Units[51]
Atlantic	67,755
Burlington	87,758
Camden	143,150
Middlesex	171,599
Monmouth	142,927
TOTAL	613,189

F. Conclusion

A 74% energy saving could provide the entire electrical energy needs for over 612,000 average homeowners in New Jersey for an entire year or almost all the average residential electric needs of Atlantic, Burlington, Camden, Middlesex and Monmouth Counties.

III. TOTAL ENERGY PRODUCTION AND CONSERVATION VALUE OF RESOURCE RECOVERY IN NEW JERSEY

A. Housing Units deriving electrical energy needs from RDF + Housing Units deriving equivalent electrical energy needs from conservation = Total Housing Units deriving entire average electrical needs.

830,000 + 612,125 = 1,412,125

B. $\frac{\text{Total households achieving entire electrical needs}}{\text{Total all year around housing units in N.J.}} = \frac{1,412,125}{2,305,293} = .612 = 61\%$

C. Conclusion:

61% of the all year-around housing units in New Jersey could derive their entire average electrical energy needs through the reuse of materials and the production of energy from municipal solid waste.

51/ 1970 Census of Housing, U.S. Dept. of Commerce, Bureau of the Census.

APPENDIX F

I. ENVIRONMENTAL IMPACTS RESULTING FROM THE MANUFACTURE[52] OF 1,000 TONS OF BLEACHED VIRGIN KRAFT PULP AND EQUIVALENT MANUFACTURE FROM DEINKED AND BLEACHED WASTEPAPER.

Environmental Effect	Virgin Fiber Pulp	Deinked Pulp	Change from Recycling (%)[53]
Virgin material use (over-dry fiber)	1,100 tons	0	-100
Process water used	47 million gal.	40 million gal.	-15
Energy consumption	23 x 10^9 Btu	9 x 10^9 Btu	-60
Air pollution effluents (transportation, manufacturing and harvesting)[54]	49 tons	20 tons	-60
Waterborne waste discharged, BOD[55]	23 tons	20 tons	-13
Net postconsumer waste disposal	850 tons[56]	550 tons[57]	-165

52/ Resource Recovery and Source Reduction, First Report to Congress, U.S. Environmental Protection Agency, SW-118, Third Edition, February 1974, p.8, Table 4.
53/ Negative number represents a decrease in that category resulting from recycling.
54/ Based on surveys conducted in 1968-70.
55/ Ibid.
56/ This assumes a 15 percent loss of fiber in papermaking and converting operations.
57/ This assumes that 1,400 tons of wastepaper are needed to product 1,000 tons of pulp. Therefore, 850- 1,400 = -550 represents the net reduction of postconsumer solid waste.

II. ENVIRONMENTAL IMPACT COMPARISON FOR 1,000 TONS OF STEEL PRODUCT [59]

Environmental Effect	Virgin Material Use	100% Waste Use	Change from Recycling [60] (%)
Virgin material use	2,278 tons	250 tons	-90
Water use	16.6 million	9.9 million	-40
Energy consumption	23,347 x 10^6 Btu	6,089 x 10^6 Btu	-74
Air pollution effluents	121 tons	17 tons	-86
Water pollution	67.5 tons	16.5 tons	-76
Consumer wastes generated	967 tons	-60 tons	-105
Mining wastes	2,828 tons	63 tons	-97

III. ALUMINUM INDUSTRY RECOVERY OF SOURCE-SEPARATED ALUMINUM CANS [61]

According to the Aluminum Asscciation, a record 3.9 billion all aluminum cans were returned for recycling in 1975 -- approximately one out of four cans sold; this was 70 percent more than in 1974. The 87,000 tons of cans amounted to 7.8 percent of the estimated total of 1.1 million tons of "old scrap" aluminum recycled from all sources in 1975. Most of the aluminum was from junked transportation equipment (including autos) and various demolition wastes.

59/ Op. Cit., Resource Recovery and Source Reduction p.9, Table 5

60/ Negative number represents a decrease in that category resulting from recycling.

61/ Resource Recovery and Waste Reduction, Fourth Report to Congress, U.S. Environmental Protection Agency, SW-600, August 1977, p.39.

The industry opened its first can collection center in 1967; there are now approximately 1,300 centers. The industry attributes the growth in aluminum can recycling to one fundamental motive: profit. The industry currently pays $300 a ton for aluminum cans and is buying all the cans it can obtain. A major reason is the industry's desire to reduce energy costs: recycling used aluminum requires less than 5 percent of the energy needed to produce aluminum from ore and produces an energy saving of 95%.

APPENDIX G

1988 PROJECTION

EMPLOYMENT POTENTIAL FROM RESOURCE RECOVERY

To determine the potential employment from resource recovery, it is first important to recognize how such employment would be generated. The first unit of employment is in the construction and operation of the resource recovery facility itself. Then certain manufacturing plants can subject the recovered materials and energy to primary processing such as in a mini-steel mill, a detinning plant, glass and paper manufacturers, and building fabricators. Other industries that could advantageously utilize the energy and the output from the primary plants could locate in the complex and its vicinity. The presence of these primary and secondary industries would then induce the gradual growth of related service activities.

In the Port Authority of New York and New Jersey's study entitled, Industrial Development - Feasibility Study, it is projected that almost 4,000 jobs could be generated in an integrated industrial recycling park of approximately 200 acres.[62] Such an industrial recycling park would be based on the utilization of a 2,000 ton per day (TPD) resource recovery facility as a source of raw materials and energy. Based on the Port Authority's projections, the DOE has assumed that in 10 years in the centralized urban areas of New Jersey there will be created at least 4 of these industrial recycling parks. Therefore, the total employment potential from resource recovery by 1988 will be on the order of 16,000 persons. Smaller decentralized applications of resource recovery technology will also contribute to this employment potential but have not been included in this estimate to ensure that it is a conservative estimate.

62/ Industrial Development Feasibility Study, Port Authority of New York and New Jersey, January 1976