New Jersey Meadowlands Commission
Renewable Energy Task Force

Background Report on New Jersey's Energy & Policy Landscape

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CENTER FOR ENERGY,
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Background Report

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Background Report

I. Introduction

New Jersey has been recognized as a leader in renewable energy, second only to California in solar photovoltaic systems.[1] The state has adopted a number of policies designed to achieve investment and deployment of clean energy technology, while also encouraging other state policy goals such as economic development and clean air. Understanding New Jersey's energy portfolio and its current policy landscape is essential to developing options for the Meadowlands District to diversify their own energy mix toward greater sustainability. The specifics of state and federal energy policy affect whether and how the Meadowlands will draft its strategy for reaching 20MW of renewable energy by 2020. This report is designed to help provide the Meadowlands Commission and its Renewable Energy Task Force members the information about the state's energy background that will enable them to have a more informed discussion of renewable options to meet their goal.

After briefly discussing New Jersey's energy portfolio in general, this report focuses on electricity within the state's energy mix. This is because the Meadowlands' renewable energy goal is similarly focused on renewable electricity generation. It also examines the different renewable energy technologies and their potential in New Jersey. Then the report provides a review of key energy policies, first broadly then targeted to those affecting renewable energy investments. Included is a summary of recent policy reports examining the impacts of different policy initiatives. Finally, a high level summary of the federal Energy Policy Act of 2005 is discussed to illustrate the current federal policies on renewable energy technologies and their deployment.

Energy use is at the core of most energy policy issues. Types and levels of energy consumption drive the demand for different sources of energy, the location of infrastructure, and the systems and technology to manage energy efficiently, reliably and cost effectively. In each case, there are economic, environmental, safety and security impacts. As shown in Table 1, New Jersey ranks high in natural gas and petroleum consumption, which is expected given the state's high ranking in transportation and commercial sectors.[2] The state's ranking in both residential and industrial sectors is also high relative to the rest of the nation.

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[1] Philadelphia Inquirer. "New Jersey Clean Energy Program a National Leader in Rebates & Tax Credits for Clean Fuel Alternatives," November 20, 2005.
[2] EIA, "Table R2. Energy Consumption by Source and Total Consumption per Capita, Ranked by State, 2000," State Energy Data 2000, Washington, DC: GPO, 2002.

CATEGORY	RANK	CATEGORY	RANK
Per Capita Consumption		*Sector Consumption*	
Coal	36th	**Residential**	11th
Natural Gas	9th	**Commercial**	9th
Petroleum	9th	**Industrial**	15th
Electricity	20th	**Transportation**	8th
Total	32nd	**Total**	12th

Table 1: New Jersey's Ranking in the Nation in Energy Consumption, 2000[3]

While New Jersey ranks high in energy consumption by sector, its overall per capita consumption ranks 32nd in the nation. However, the issue is not New Jersey's energy consumption alone, but its impact on the environment and in the long-term security and continued availability of fossil fuels. Due to these concerns the state is pursuing renewable energy, distributed energy technology, and energy efficiency programs as well as stricter environmental policies. Renewable energy provides a source of clean energy that addresses environmental issues and when coupled with distributed energy technology, it may also improve reliability.

Table 2: Comparison of NJ to US Energy Consumption, 2000[4]

	Fossil Fuels	Nuclear Energy	Other*	Net Inflows
New Jersey	74%	11%	1%	14%
United States	85%	8%	7%	NA

** Other includes hydroelectric, wood and waste, and renewable energy sources.*

As Table 2 above illustrates, New Jersey started off this decade with only a small percentage of renewable energy, a large net importer of electricity from other states, and more dependent on nuclear energy for its electricity than the nation as a whole. Decisions about nuclear plant relicensing, fossil fuel plant retirements and a growing solar industry are set to change this mix over the next 20 years. The Meadowlands is poised to play its own part in that future in deciding how best to meet its goal of providing 20 MW of its electrical generation via renewable energy while encouraging its other goals of greater economic development, energy efficiency and sustainability.

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[3] Ibid.

[4] Energy Information Administration, U.S. Department of Energy (EIA). "Table S1. Energy Consumption Estimates by Source and End-User Sector, 2000," State Energy Data 2000, Washington: GPO, 2002. Net inflows are based on the net amount of electricity that came into the State during the year.

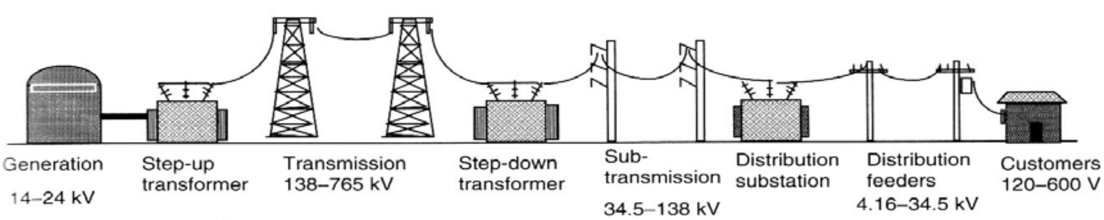
II. Summary of New Jersey Electricity Data

Electric power and the energy required to generate, transmit, and distribute it is vital to the well-being of the State. New Jersey policymakers and the public directly influence aspects of the electric power industry. New Jersey is part of a regional electric power market that spans the Mid-Atlantic region of the country and is part of the Eastern interconnection or grid. The electric power industry comprises a diverse group of companies and tasks, all of which face different market structures, regulatory environments, and planning horizons. Generation, transmission, and distribution facilities and grid operators must coordinate their activities in order for power to be adequately and reliably supplied.

Meeting any growth in demand requires policymakers to consider additional electric energy supply within New Jersey, and possibly additional investments in infrastructure and energy efficiency. Policy concerns such as public health, environmental stewardship, volatile and increasing fossil fuel prices, national security, and economic development are motivating energy policies that promote new types of resources, including renewable resources and energy efficiency measures. New energy investments require significant time and capital. Investments in new power plants or transmission lines, for example, are essentially commitments to current technologies and facilities for many decades. New Jersey and the region also have a variety of renewable energy resources that are being encouraged by policymakers as a growing part of its electricity fuel mix.

The basic three functions within the electric power industry are generation, transmission, and distribution. Figure 1 illustrates the relationship among these three components. Generation has traditionally consisted of large-scale plants, such as nuclear or coal-fired power plants. Distributed generation[5] and renewable resources may play more of a role in power generation, especially in back-up generation as states like New Jersey enact new policies encouraging them. Transmission consists of transmission lines, which are almost exclusively alternating current (AC), transformers, and other components. Distribution refers to the local facilities that feed power directly into the site where it is used, such as a home or office.

Figure 1: The Electric Power Industry[6]



[5] Distributed generation refers to smaller or localized electric generating units such as solar panels, fuel cells, or backup generators located near consumers. Backup generators are often run on diesel fuel.
[6] Gilbert M. Masters, Renewable and Efficient Electric Power Systems, Wiley, 2004

New Jersey is also part of a regional electricity market and regional power grid. The Mid-Atlantic Area Council (MAAC), which serves as the regional reliability organization, and the regional transmission organization (RTO) operating the wholesale market, Pennsylvania-New Jersey-Maryland Interconnection (PJM), have different but overlapping roles with respect to grid reliability. The MAAC is part of the North American Electric Reliability Council (NERC), which was formed in 1968 to coordinate, standardize and formalize reliability requirements across regions of the country. New Jersey is part of the larger PJM system that manages market transactions and supply and demand through an independent entity. The amount of electricity generated in a given year within the state depends on a larger system of electricity supply and transmission. PJM coordinates the movement of wholesale electricity in all or parts of Delaware, Illinois, Indiana, Kentucky, Maryland, Michigan, New Jersey, Ohio, Pennsylvania, Tennessee, Virginia, West Virginia and the District of Columbia. PJM monitors the high-voltage transmission grid 24 hours a day, seven days a week to keep the electricity supply and demand in balance by telling power producers how much energy should be generated and by adjusting import and export transactions.[7]

A. Electricity Generation Data

New Jersey is home to a number of electricity generation facilities that use primarily coal, natural gas and nuclear energy sources to supply power throughout the state. Figure 2 below shows the electricity generated in New Jersey to supply the system and the breakdown among the various sources of electricity generation. For most of the last decade nuclear power has been the largest single source of electricity generation.[8] Natural gas is growing as a fuel to meet the increasing demand for electricity.[9] The amount of electricity by each power plant in New Jersey varies from year to year depending on the cost of different fuel sources for the power plant, demand and other market factors.

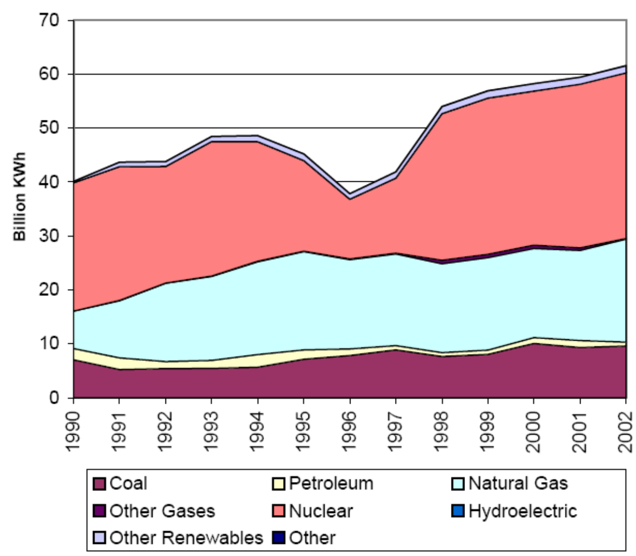


Figure 2: Generation of Electricity by Primary Energy Source in New Jersey, 1990-2002[10]

[7] PJM Interconnection website, About PJM – Overview. (http://www.epjmtraining.com/about/overview.html)
[8] Ibid.
[9] Ibid.
[10] Energy Information Administration, U.S. Department of Energy (EIA), Electric Power Annual 2002, December 2003.

Generating capability in New Jersey has grown from 1990 to 2002 from 15,837 MW to 18,384 MW.[11] The growth in generation capacity in the last decade has been largely in the area of natural gas and dual-fired power plants. How much electricity is generated in New Jersey's near future will depend on decisions regarding the license renewal of the Oyster Creek nuclear facility, which expires in 2009, and the potential of PSE&G to retire or divest some of its electric generation facilities as part of its proposed merger with Exelon.[12] Growth in renewable energy electricity generation provides an opportunity to offset changes in domestic supply of electricity. New Jersey has provided a regulatory infrastructure for increasing renewable and distributed generation through the renewable portfolio standard and net-metering provisions of state statutes discussed later in this report. There is also a burgeoning economic infrastructure to support the growth of solar electricity generation.

B. Electricity Usage by Sector and Projected Growth

Regional demand for electricity is increasing at roughly 1.4 % per year.[13] The capacity margin is the amount of additional capacity above peak demand, which occurs in the PJM region in the summer. Currently, the region has a slight surplus, but according to MAAC estimates, the margin is expected to tighten over the next several years.[14] This narrowing margin suggests that new generation facilities will be needed in the future, a need that should be anticipated by policymakers. Typically, new generation is not announced more than 5 years ahead of time; the time line for planning and developing new generation capacity can be lengthy.

Electric energy efficiency programs may also be effective ways to manage energy use, reduce environmental impacts, and save money. New technology such as digital controls and consumer-based technologies may pave the way for better demand response by end users. Stricter environmental programs may also achieve the same results but at different costs. Important tradeoffs exist between choosing among these different options of renewable energy, distributed generation, energy efficiency, and environmental requirements. These trade-offs do not mean that choosing one option eliminates the others, but that there can be different levels of support for each policy combined to meet the Meadowlands renewable energy goals.

III. Renewable Electric Energy Resources in New Jersey

The effectiveness of renewable energy technologies are in part a measure of the available level of the renewable resource in the region of the state or county that one plans to deploy. This section of the report reviews the potential of various renewable electric energy resources and energy efficiency measures in New Jersey.

[11] EIA, State Electricity Profiles 1999 and 2002, January 2004.
[12] EIA, U.S. Nuclear Reactors – State Nuclear Industry, New Jersey, August 4, 2004 and BusinessWire. "Exelon and PSEG Announce Agreement with U.S. Department Of Justice," June 22, 2006.
[13] EIA State Energy Data 2001, accessible at http://www.eia.doe.gov/emeu/states/_use_multistate.html.
[14] ReliabilityFirst website, accessible at http://www.reliabilityfirst.com/index.jsp. ReliabilityFirst is the successor entity to MAAC following a merger of three previous NERC reliability regions.

A. Solar

The sun is a direct source of energy. Using renewable energy technologies can convert solar energy into electricity, heating, and even cooling. Solar resources are expressed in watt-hours per square meter per day (Wh/m^2/day). Solar energy, however, varies by location and time of year. Solar resources are greatest in the middle of the day — the same time that electricity customers have the highest demand, especially during summer months. According to Navigant Consulting in a report commissioned by the New Jersey Board of Public Utilities, the technical potential for solar resources in New Jersey, after adjusting for shading, orientation and other losses, could be as high as 8,560 MW for residential buildings and 6,815 MW for commercial and industrial buildings.[15]

Flat-plate solar systems are flat panels that collect sunlight and convert it to electricity or heat. These technologies include photovoltaic (PV) arrays and solar water heaters. Figure 3 shows how much solar radiation reaches a flat-plate collector that is installed in a tilted position, for example, on a roof. For flat-plate collectors, New Jersey has sufficient solar resources to generate electricity for homes and commercial buildings, with southern New Jersey having the best resource. Because of their simplicity, flat-plate collectors are often used for residential and commercial building applications, but can also be used in large arrays for large-scale applications.

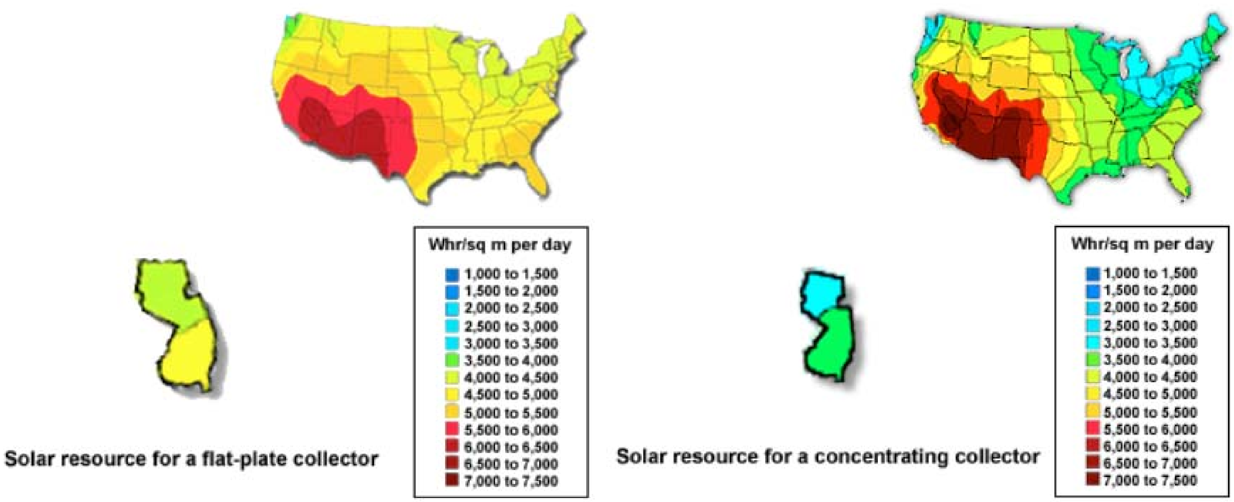


Figure 3: Solar Resources in New Jersey[16]

Solar concentrators are typically mounted on tracking systems in order to always face the sun to capture the maximum amount of direct solar rays. The solar resource for concentrators varies much more across the United States than the flat-plate solar resource. Figure 3 shows that, for concentrating collectors, New Jersey has a limited resource. Because these systems require

[15] Navigant Consulting, Inc., 2004.
[16] US DOE, EERE, "New Jersey Solar Resources," State Energy Information – New Jersey. State Energy Alternatives Website, updated July 21, 2004. (http://www.eere.energy.gov/state_energy/tech_solar.cfm?state=NJ)

tracking mechanisms, solar concentrators are generally used for large-scale applications such as utility or industrial use, but they can also be used in small-scale applications, including remote power applications. New Jersey has a committed effort to develop solar power as part of its Clean Energy Program and Renewable Portfolio Standard discussed further below.

B. Wind

There are both large wind turbines for wholesale applications and with small wind turbines for on-site generation. Wind is classified according to wind power classes, which are based on typical wind speeds, ranging from class 1 (the lowest) to class 7 (the highest). In general, wind power class 4 or higher can be used to generate wind power with large-scale turbines, and small turbines can be used at any wind speed. Figure 4 shows general wind power classes for the U.S. and New Jersey and indicates that the state has good wind resources in portions of the state, mostly in the coastal region.

Wind power estimates apply to areas free of local obstructions to the wind and to terrain features that are well exposed to the wind, such as open plains, tablelands, and hilltops. Within the mountainous areas identified, wind resource estimates apply to exposed ridge crests and mountain summits. In New Jersey, there are a couple of “ridgelines” at the north end of the state that provide the only non-coastal wind resources above Class 3. Local terrain features can cause the mean wind energy to vary considerably over short distances, especially in areas of coastal, hilly, and mountainous terrain. Although the wind resource maps identify many areas estimated to have high wind resource, the map does not depict variability caused by local terrain features. According to a report by Navigant Consulting, the technical potential for on-shore wind power, after excluding land not suitable, is estimated to be 127 MW.[17]

According to the Navigant Report, off-shore wind resources in New Jersey are much more significant than on-shore with potential Class 6 wind resources available. The maximum theoretical potential is 24,500 MW. To determine what the technical potential could be for New Jersey, the report assumed that only 10% could be developed in the 2005-2020 time period, which is a technical potential of nearly 2,500 MW of off-shore wind resources.[18] New Jersey established a Wind Commission to study the implications of off-shore wind in New Jersey.[19] The Commission’s final report is summarized below in Section VI. B.

[17] Navigant Consulting, Inc. , New Jersey Renewable Energy Market Assessment, August 2, 2004. (http://policy.rutgers.edu/ceeep/images/NJ_REMA_Final_08-04.pdf)
[18] Ibid.
[19] Lane, Alexander, “Codey to block energy windmills in ocean for a year,” The Star Ledger, December 9, 2004.

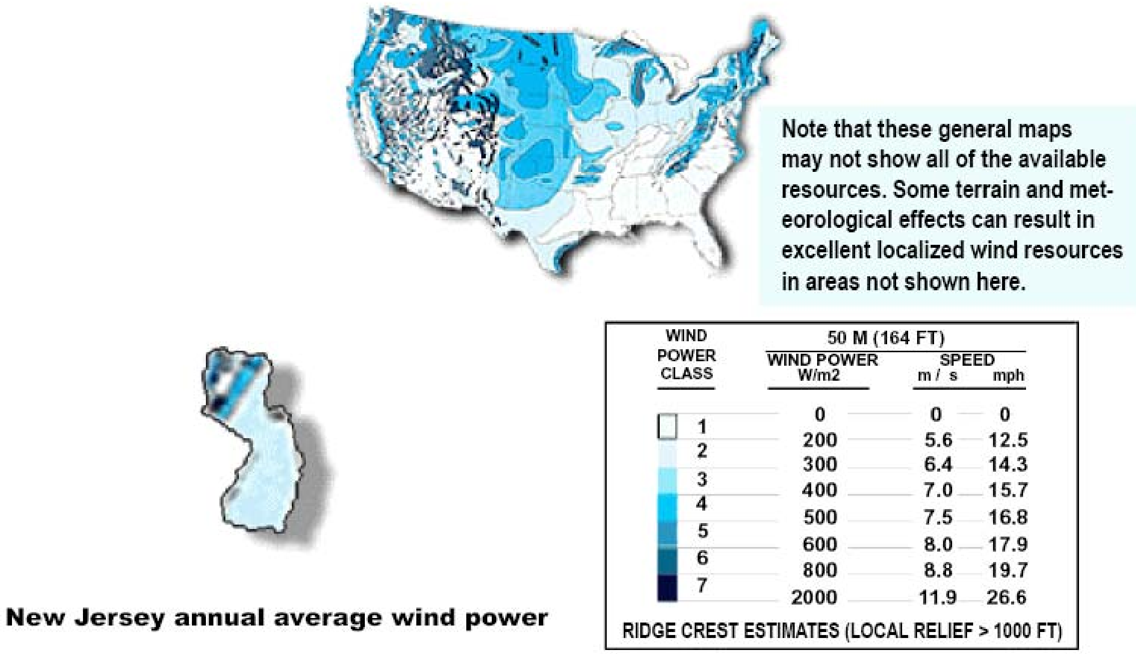


Figure 4: US and New Jersey Annual Average Wind Power[20]

C. Biomass and Landfill Gas/Biogas

All plant or plant-derived material—biomass—from trees and grasses, agricultural crops, agricultural or forestry residues, and waste materials from plant products can be used to produce bioenergy. For heating applications or electricity generation, biomass can be burned in its solid form, or first converted into liquid or gaseous fuels for energy sources. Biomass power technologies convert renewable biomass fuels into heat and electricity using modern boilers, gasifiers, turbines, generators, fuel cells, and other methods.

For transportation use, liquid fuels made from biomass (biofuels) are used. The two most common biofuels used in the United States today are ethanol and biodiesel. Biomass materials that are byproducts from activities such as wood products manufacturing, construction, agriculture, and forest harvesting or management are referred to as residues. Recent studies indicate that New Jersey has a fair biomass resource potential. An estimated 1.4 billion kWh of electricity could be generated using renewable biomass fuels in New Jersey.[21] This is enough

[20] U.S. Department of Energy, Energy Efficiency and Renewable Energy (US DOE, EERE), "New Jersey Wind Resources," State Energy Information – New Jersey State Energy Alternatives Website, updated July 21, 2004. Available at http://www.eere.energy.gov/state_energy/tech_wind.cfm?state=NJ.

[21] US DOE, EERE, "New Jersey Bioenergy Resources," State Energy Information – New Jersey. State Energy Alternatives Website, updated July 21, 2004. (http://www.eere.energy.gov/state_energy/tech_bio-mass.cfm?state=NJ)

electricity to fully supply the annual needs of 142,000 average homes, or 7 percent of the residential electricity use in New Jersey.[22]

These biomass resource supply figures are based on estimates for five general categories of biomass: urban residues, mill residues, forest residues, agricultural residues, and energy crops. Wood is the most commonly used biomass fuel for heat and power. The most economic sources of wood fuels are usually urban and mill residues. Urban residues used for power generation consist mainly of chips and grindings of clean, non-hazardous wood from construction activities, woody yard and right-of-way trimmings, and discarded wood products such as waste pallets and crates. Mill residues, such as sawdust, bark, and wood scraps from paper, lumber, and furniture manufacturing operations are typically very clean and can be used as fuel by a wide range of biomass energy systems. The estimated supplies of urban and mill residues available for energy uses in New Jersey are 648,000 and 21,000 dry tons per year, respectively.[23]

Forest residues include underutilized logging residues, imperfect commercial trees, dead wood, and other non-commercial trees that need to be thinned from crowded, unhealthy, fire-prone forests. The estimated supply of forest residues for New Jersey is 131,000 dry tons per year.[24] Agricultural residues are the biomass materials remaining after harvesting agricultural crops. These residues include wheat straw, corn stover (leaves, stalks, and cobs), orchard trimmings, rice straw and husks, and bagasse (sugar cane residue). An estimated 33,000 dry tons per year is available from corn stover and wheat straw in New Jersey.[25] Energy crops are crops developed and grown specifically for fuel. These crops are carefully selected to be fast-growing, drought and pest resistant, and readily harvested alternative crops. Energy crops include fast-growing trees, shrubs, and grasses such as hybrid poplars, hybrid willows, and switchgrass, respectively.

For New Jersey, the production potential for energy crops is estimated at 143,000 dry tons per year.[26] In New Jersey, Class I biomass resources are tree residues, yard trimmings, forestry residues, agricultural residues, lumber and mill waste and bioenergy crops. The Navigant Report estimates that the technical potential is approximately 14-15 trillion Btu of Class I biomass, half of which are tree residues.[27] For solid biomass fuel, the technical potential is estimated in the report to be about 114 MW, growing to 240 MW by 2020 assuming technological advances. In addition, the report estimates that landfill gas could add an additional 64 MW of additional capacity to the technical potential of biomass. There currently is about 90 MW of landfill gas capacity operating in New Jersey. According to the U.S. Environmental Protection Agency, the Meadowlands District has at least 5.7 MW of this landfill capacity currently operational.[28] Similar to landfill gas, biogas from wastewater treatment plants could add another approximately

[22] Ibid.
[23] Marie E. Walsh, et. al., Biomass Feedstock Availability in the United States: 1999 State-Level Analysis, Oak Ridge, TN: Oak Ridge National Laboratory, April 30, 1999, updated January, 2000.
[24] Ibid.
[25] Ibid.
[26] Ibid.
[27] Navigant Consulting, Inc. for CEEEP. New Jersey Renewable Energy Market Assessment, August 2, 2004.
[28] U.S. Environmental Protection Agency. LMOP Landfill Database, August 2, 2006, available at http://www.epa.gov/lmop/proj/index.htm.

19 MW to the technical potential of biomass. There is currently only 900 kW of biogas capacity operating in New Jersey.[29]

D. Hydroelectric

Large volumes of water that travel through a significant change in elevation are needed to generate useable hydropower resources. New Jersey has a low amount of developed hydropower resource as a percentage of the state's electricity generation. The U.S. Department of Energy estimates that New Jersey could produce an estimated 300 MW of annual mean hydropower.[30]

E. Geothermal

Direct heat resources can be used to provide heat in a variety of applications. Geothermal heat pumps are similar to conventional air conditioners and refrigerators. Whereas air conditioners and refrigerators discharge waste heat to the air, geothermal heat pumps discharge waste heat to the ground during cooling season and extract useful heat from the ground during heating season. Direct-use applications require moderate temperatures; geothermal heat pumps can operate with low-temperature resources. New Jersey has low-to-moderate-temperature resources that can be tapped for direct heat or for geothermal heat pumps; however, electricity generation is not possible with these resources.[31]

F. Energy Efficiency and Distributed Generation

Besides producing more energy to meet growing demand, managing energy through energy efficiency programs and distributed generation can also change both the level of energy use, but also the infrastructure involved. This section discusses the technical and market potential of both energy efficiency and distributed generation and its potential impact on infrastructure. Both greater efficiencies or on-site generation helps to relieve strain on the transmission and distribution infrastructure and thereby can improve reliability and potentially reduce costs during peak demand periods.

An August 2004 report by KEMA, Inc. (KEMA Report) examined a number of energy efficiency and distributed generation programs to estimate their technical, economic and market potential for saving electricity and natural gas consumption. These programs included residential targeted energy efficiency programs for new construction, low-income residents, HVAC installations and Energy Star certified products. For commercial and industrial energy efficiency programs, the report examined programs for retrofitting, renovation and new construction, and industrial process improvements. In the area of distributed generation, the KEMA report examined the programs involving commercial and industrial on-site generation, fuel cells and zero emission homes. Table 3 below displays some of the results of that study and the level of market potential for both electricity and natural gas savings.

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[29] Navigant Consulting, Inc. for CEEEP, New Jersey Renewable Energy Market Assessment, August 2, 2004.
[30] US DOE, EERE – Wind and Hydropower Technologies, Water Energy Resources of the United States with Emphasis on Low Head/Low Power Resources, April 2004, Appendix B, pp. B-123.
[31] US DOE, EERE, "New Jersey Geothermal Resources," State Energy Information – New Jersey. State Energy Alternatives Website, updates July 21, 2004. (http://www.eere.energy.gov/state_energy/tech_geothermal.cfm?state=NJ)

Table 3: Energy Efficiency and Distributed Generation Market Potential[32]

Program Concept	Market Potential (MW)	Market Potential (GWh)	Market Potential (MTherm)
Residential Electric & Gas			
New Construction	18	50	11
Low Income	304	875	173
HVAC	1,307	1,630	714
Energy Star	118	2,264	122
Commercial/Industrial Electric & Gas			
Retrofit	1,538	6,665	-
Renovation/ New Construction	26	98	-
Industrial Processes	146	896	-
Commercial/Industrial Gas	-	-	314
Distributed Generation			
Commercial and Industrial	583	-	-
Fuel Cells	218	-	-
Zero Emission Homes	132	-	-

IV. Summary of New Jersey Energy Policies

In understanding the direction of New Jersey's energy policy, there are a number of key documents and policy statements that are useful to review. The first is a summary of Governor Corzine's report of his Transition Team on Energy reviewing those policies relevant to this report. It provides an overview of the Governor's energy priorities and the objectives. The second document is the New Jersey Board of Public Utilities' Strategic Plan. A living document, the Plan was created to help the NJ BPU in clarifying key policy areas where the agency wanted to proactively focus policy efforts. This report excerpts sections from these two documents focusing on renewable technology goals and objectives.

A. Governor Corzine's Energy Policy Transition Report[33]

In a report to Governor Corzine from his Energy Policy Transition Team, ten major policy recommendations were made to guide the new administrations energy policy. Provided here are portions of the executive summary of that energy transition report and its recommendations that will likely form the foundation of the Governor's energy policy during his first term.

The energy transition report states:

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[32] KEMA, Inc., "New Jersey Energy Efficiency and Distribute Generation Market Assessment," August 2004, available at http://policy.rutgers.edu/ceeep/ events_new.html

[33] Energy Transition Policy Group Prepared for Governor-Elect Jon S. Corzine. "Final Report of the Energy Transition Policy Group," January 19, 2006.

As Governor-Elect Corzine prepares to take office, New Jerseyans are more focused on energy than they have been in decades. Skyrocketing fuel prices, the increasing impacts of global warming, and other vivid reminders of America's fossil fuel dependence have dramatically raised the profile of this issue. This situation will pose some tremendous challenges for the Corzine administration, beginning immediately with the task of helping New Jerseyans cope with oppressive winter heating bills. But it also presents an unparalleled opportunity to make New Jersey the national leader in progressive energy policy and economic development around renewable and advanced energy technologies. Jon Corzine was elected Governor on the strength of a platform that promised a more affordable New Jersey; economic development around emerging industries of the 21st century; improved environmental stewardship, and a new approach to governing that was more responsible and forward thinking. Few areas present more opportunity to deliver on this vision than energy policy.

The recommendations as identified in the transition report that were most relevant to the Meadowlands Commission's goals are as follows:

- **Create more stability in New Jersey's renewable energy and energy efficiency programs.** Instability in these programs, which includes uncertainty about future funding commitments, has hindered businesses' ability to plan and make long-term investments. Specific steps to increase stability and spur more investment should include extending Clean Energy Program funding for at least five years beyond its current expiration in 2007, and instructing BPU staff to develop a long-term plan for transforming the renewable energy market so that renewables can compete with fossil fuels.
- **Target economic development initiatives toward the renewable and advanced energy technology industry.** Early in his administration, Governor Corzine will be implementing ambitious reforms in how the state pursues economic development. These efforts should prioritize significant resources for renewable and advanced energy technologies, a job-intensive industry in which New Jersey is poised to become the national leader. To ensure that this happens, Governor Corzine should instruct the President of the BPU, the CEO of the EDA, the Executive Director of the Commission on Science and Technology, and the Governor's top economic development advisor to report to him by May 1, 2006 with an initial strategy for working together to promote economic development in this industry.
- **Identify sources of capital to support a large-scale investment in cost-effective energy efficiency and renewable energy for state and local government facilities.** With proper financing, a significant capital investment in this area would be revenue positive, resulting in financial benefits for state and local governments for decades to come. Funding options include revenue bonds (paid back with a portion of energy savings), long-term 'performance contracts' (also repaid with energy savings), and/or public-private partnerships.
- **Establish a world-class research center and business incubator in New Jersey for renewable energy and advanced energy technologies.** This center would create a hub of activity that would attract businesses and create linkages between R&D, technology

deployment, and business development. A combination of economic development and clean energy resources can be used to make this happen. The group recommends considering Ft. Monmouth as a home for this center, and linking the center to New Jersey's institutes of higher learning.

The transition report also put forth two major recommendations regarding energy efficiency as well that should be considered with the broader goals of the Meadowlands Commission.

- **Develop annual energy reduction goals and strategies that will help New Jersey reach the Governor-Elect's goal of reducing energy usage by 20% by 2020.** The BPU can develop this plan in conjunction with the Clean Energy Council and utilizing the Energy Master Plan process. By June 1, 2006, the BPU should report back to the Governor with initial reduction goals and policy recommendations for the next four years, and a timeline for further development of those goals and recommendations. The Governor should adopt an Executive Order to make the goal and interim steps official. This group believes such a plan must include the following initiatives:
  - Upgrade energy building codes for residential and commercial construction, and institute additional performance requirements for publicly-funded construction.
  - Set minimum efficiency standards for common household and commercial products that are currently unregulated.
- **Appoint a Director of Energy Savings and Sustainability in the Department of Treasury to immediately begin helping reduce State energy expenses.** State and local government can save tens of millions of dollars through conservation, improved fleet and building efficiency, improved procurement, and the installation of on-site generation. The Director should report directly to the Treasurer and be empowered to make real changes in how government buys and uses energy.

In addition, the transition report made these other energy related recommendations:

- **Work with the BPU to promote the safe, reliable, and secure delivery of energy.**
- **Launch a home heating relief initiative to help New Jerseyans cope with winter heating bills.**
- **Implement a long-term solution to funding the Transportation Trust Fund (TTF).**
- **Issue an Executive Order instructing state agencies to take all necessary actions to prevent drilling off of the Jersey shore.**

B. New Jersey Board of Public Utilities' Strategic Plan[34]

The NJ BPU's Strategic Plan establishes goals and objectives for the agency and its staff to pursue during the next four years (2005-2008) and beyond. In it, the NJ BPU states that they hope to move the agency towards "a more proactive public policy making body focused on results based management" and away from "short-term planning." The NJ BPU believes that

[34] New Jersey Board of Public Utilities. "Strategic Plan: 2005-2008 and Beyond," January 2005 available at http:// http://www.bpu.state.nj.us/tmp/NJBPUStrategicPlan.pdf.

"longer range strategic planning and goal-setting capability is critical in today's new regulatory environment."

The NJ BPU's mission is "To ensure the provision of safe, adequate and proper utility and regulated service at reasonable rates, while enhancing the quality of life for the citizens of New Jersey and performing these public duties with integrity, responsiveness and efficiency."

In applying this mission statement, the Strategic Plan sets out a number of goals and objectives in a variety of areas. The different goals and a list of objective areas are provided below. Since the focus of this report is renewable energy policies, only high-level goals and objectives are excerpted below except for those that pertain to renewable energy in which case specific objectives are also listed.

The Strategic Plan has four goals:

A. Ensure and enhance the provision of Safe, Adequate and Proper Services by Regulated Entities.
B. Ensure the provision of Regulated Services at Reasonable Rates while promoting Competition where appropriate.
C. Enhance the Quality of Life for the Citizens of New Jersey by providing Assistance Programs, promoting Smart Growth Development, protecting and enhancing Environmental Quality and conserving Natural Resources.
D. Perform public duties with Integrity based on openness and transparency in governance, be responsive to the Needs and Concerns of the Citizens of the State of New Jersey and enhance Efficiency of Operations.

Within the first area of safe, adequate and proper services, the Strategic Plan lays out three objective areas: Performance Standards, Security and Safety, and Reliability and Adequacy. In the area of reasonable rates while promoting competition, the objective areas include: Reasonable Rates, Corporate Governance and Competition. The third goal includes all of the objectives related to renewable energy. The objective areas include Assistance Programs, Smart Growth Development and Renewable Energy and Conservation. In the next section, the specific objectives related to the third objective area are provided to give a more in depth look at the NJ BPU's goals and objectives in this critical area. Finally, the fourth goal includes objectives on Governance and Code of Ethics, Operational Efficiency and Customer Service.

In order to implement the Strategic Plan, an agency Action Plan is being developed to define the metrics used to measure the performance related to each objective, the target needed to achieve the objective and well defined strategies and measurement protocols that will provide a basis for monitoring and for periodic adjustments in the strategic direction the agency is pursuing in order to achieve the respective objectives.

The specific NJ BPU Renewable Energy and Conservation Objectives are the following:

- By 2008, six and a half percent of the electricity used by New Jersey residents and businesses will be provided by Class I[35] and/or Class II renewable energy resources, of which a minimum of four percent will be from Class I renewable energy resources.
- By 2008, foster installation of 300 Megawatts (MW) of Class I renewable electric generation capacity in New Jersey, of which a minimum of 90 MW shall be derived from photovoltaics.
- By 2012, 785,000 Megawatt hours per year and 0.6 billion cubic feet gas per year of energy savings will be derived from measures installed under the Clean Energy Program.
- By 2020, twenty percent of the electricity used by New Jersey residents and businesses will be provided by Class I renewable energy resources.
- By December 2006, prepare a comprehensive energy master plan for a period of 10 years on the production, distribution, consumption and conservation of energy in New Jersey. The Electricity component of the Master Plan will be drafted by December 2005.

V. Summary of New Jersey Renewable Energy Policy

This section provides a summary of New Jersey's restructuring of the electricity markets, the state's energy programs and policies that are available to customers who choose to deploy renewable technology. The focus is on the Renewable Portfolio Standard (RPS), Renewable Energy Credits (RECs), and rebate and incentive programs that may help fund solar photovoltaic and other renewable energy systems in the Meadowlands District.

A. Electric Discount Energy Competition Act (EDECA)[36]

On February 9, 1999, the Electric Discount and Energy Competition Act (EDECA), was signed into law and required that by no later than August 1, 1999, each electric public utility provide retail choice of electric power suppliers for its customers. In addition EDECA required each electric public utility to reduce its aggregate level of rates for each customer class by no less than five percent; unbundle its rate schedules and provide credits to customers who choose alternative electric power suppliers; implement a Societal Benefits Charge (SBC) to recover the cost of previously approved social, environmental and demand side management programs which were included in each utility's unbundled rates; and implement a market transition charge to allow each utility the opportunity to recover stranded costs.

EDECA also required that for at least three years, and thereafter until the Board specifically finds otherwise, each electric public utility provide basic generation service to customers who have not chosen an alternate electric power supplier. Further, EDECA permits electric public utilities to either functionally separate or divest to an unaffiliated company, all or a portion of their electric

[35] Class 1 renewable energy is defined in the Electric Discount and Energy Competition Act as "electric energy produced from solar technologies, photovoltaic technologies, wind energy, fuel cells, geothermal technologies, wave or tidal action, and methane gas from landfills or a biomass facility."

[36] New Jersey Statutes Annotated 48:3–49 et seq. "Electric Discount Energy Competition Act (EDECA)," 1999.

generation assets. EDECA gave the electric utilities added flexibility to make business decisions regarding the sale of their generation assets and the purchase of energy and capacity to meet the electricity needs of their customers.

The mechanics of the retail and wholesale market in the post-EDECA electric utility environment provides certain opportunities for the Meadowlands Commission as it seeks to deploy 20 MW of renewable energy. As described further below, if the renewable energy technology meets state rules and is providing electricity behind the meter, utilities must credit the customer at retail rates. However, if the electricity is being directed into the grid, the Meadowlands still has options as a wholesale supplier of electricity with rights granted to it under the competition provisions of EDECA.

B. Renewable Portfolio Standard

As part of the EDECA, New Jersey also adopted its Renewable Portfolio Standard (RPS) that requires electricity suppliers to acquire a minimum percentage of their power from renewable sources.[37] The law included provisions for net metering[38], the creation of a "clean energy fund", and disclosure of energy sources to customers. The SBC described above was added to the cost of each kilowatt-hour of electricity sold in the state to fund. The SBC yielded approximately $125 million annually from 2001 to 2004 and $180 million from 2005 to 2008 to support renewable and energy efficiency programs; 25 percent is earmarked for renewable energy technologies.

In April 2004, the NJ BPU adopted two changes to the state's RPS, setting a 6.5% RPS and a solar carve out of 90 MW of generation capacity by 2009.[39] In June 2004, the NJ BPU commenced the statutorily required update to the "comprehensive resource analysis" (CRA) to determine the market demand and appropriate level of funding energy efficiency and renewable energy programs to be supported by the SBC for 2004 through 2008. In April 2006, the NJ BPU approved new regulations that expand the RPS so that 20% of New Jersey's electricity must come from renewable sources by 2020.[40] The new regulations also include a 2 percent solar set aside that is forecast to require 1500 MW of solar capacity also by 2020.

Renewable energy is broken into two classes. Class I renewable resources include electric energy produced from solar electric generation in the form of solar Renewable Energy Credits (RECs), wind energy, fuel cells with renewable fuels, geothermal technologies, wave or tidal action, and methane gas from landfills or a biomass facility, provided that the biomass is cultivated and harvested in a sustainable manner. Class II renewable resources include energy produced at a resource recovery facility or a hydropower facility operating at less than 30 MW, provided that such facilities are located where retail competition is permitted and meets NJ DEPs highest environmental standards and minimizes any impacts to the environment and local communities.

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[37] Ibid.

[38] Net-metering is the term for selling back or being credited by the utility for the electricity generated on-site, discussed more below.

[39] New Jersey Board of Public Utilities. "Renewable Portfolio Standards (RPS) Rules Adoption," N.J.A.C. 14:8-2, April 13, 2006.

[40] Ibid.

The NJ RPS regulations require:

- To qualify as Class I or Class II renewable energy for the purposes of this subchapter, energy shall be generated within or delivered into the PJM region…Energy shall be considered delivered into the PJM region if it complies with the energy deliverability rules established by PJM Interconnection.
- If Class I or Class II renewable energy is generated outside of the PJM region, but was delivered into the PJM region, the energy may be used to meet the requirements of this subchapter only if the energy was generated at a facility that commenced construction on or after January 1, 2003.

Alternative compliance payment (ACP) and solar alternative compliance payments (SACP) provide suppliers an option for compliance with renewable energy portfolio standards (RPS), in instances of renewable energy certificate (REC) scarcity or unavailability, or in cases where the price is unexpectedly high due to the exertion of market power. The NJ BPU determined that the 2004 ACP amount be set at $50.00/MWh and an SACP be set at $300.00/MWh. The payments were set at levels that balanced the need to support the renewable energy market and protect the state's ratepayers and electricity consumers. The requirements of N.J.A.C. 14:8-2.10 (b) and (c) provides "the Board shall review the amount of ACPs and SACPs at least once per year, in consultation with the ACP advisory committee", and requires the Board to adjust the ACP and SACP amounts as needed to "reflect changing conditions in the environment, the energy industry, and markets."

All states in the Northeast include solar power in their RPS. Nevertheless, some states specify that solar energy must come from photovoltaic technologies, and others do not. Some states specifically list solar technologies and photovoltaic technologies as two separate fuel sources. New Jersey lists photovoltaic technologies separately from solar technologies, but it does not outline which technologies beyond photovoltaics would qualify as solar technologies.

C. Solar Renewable Energy Credits[41]

SREC stands for Solar Renewable Energy Certificate and is a tradable certificate that represents all the clean energy benefits of electricity generated from a solar electric system. Each time a solar electric system generates 1000 kWh (1 MWh) of electricity, an SREC is issued which can then be sold or traded separately from the power. This makes it easy for individuals and businesses to finance and invest in clean, emission free solar power. New Jersey also allows generators within PJM to participate in the NJ RPS freely.[42] Generators outside of PJM must import their electricity into PJM in order to qualify for REC trading and must have begun their operations after January 1, 2003. However, New Jersey’s solar set-aside is unique in that only solar generators within NJ are eligible for the set-aside.

The New Jersey SREC Program provides a means for SRECs to be created and verified through its website. The system facilitates the sale of SRECs to electric suppliers who are required to

[41] Ibid.
[42] Clean Energy States Alliance, New Jersey Board of Public Utilities, Office of Clean Energy and CEEEP. “Northeast RPS Compliance Markets: An Examination of Opportunities to Advance REC Trading,” October 12, 2005.

purchase SRECs under New Jersey's RPS. This requirement increases each year, so that SRECs from the equivalent of a total of 90 MW of solar electricity will be required by 2009. New Jersey currently contracts with Clean Power Markets, Inc. to track their solar RECs, all other RECs are traded using PJM GATS system. One must first register for an electronic account on the NJ Clean Energy website. Then SRECs will be deposited in an account and will be able to be listed for sale on the SREC bulletin board.

The Board or its designee, Clean Power Markets, Inc., issues solar RECs and class I RECs based on electricity generated by a customer-generator on the customer-generator's premises. For solar generators smaller than 10 kW, an engineering estimate will be used to calculate the monthly SREC generation. For solar electric systems that are larger than 10 kW, the SREC website will allow one to upload their monthly meter readings and/or production information into the site. Under the net metering and interconnection rules of N.J.A.C. 14:8-4:2, a customer-generator is defined as "a residential or small commercial customer that generates electricity, on the customer's side of the meter.

D. REC Markets Outside New Jersey

Currently, many states place limitations on which out-of-state generators can qualify to trade RECs on their markets. State REC-trading policies are further complicated by the restrictions of the regional attribute tracking systems. The northeast contains three major electricity wholesale markets, each of which is operated by an independent system operator (ISO). They are ISO-NE (New England), NYISO (New York), and PJM (PA-NJ-MD-DE-DC and other states). These markets establish the price of energy, which changes hourly, and varies with the location at which the energy is produced by generation units and consumed by load. PJM Generation Attribute Tracking System (GATS), which became operational in August 2005, creates certificates for any generator that delivers into PJM. However, GATS does not necessarily require deliverability of electricity into PJM in order to create certificates. External generators that are not scheduled and delivered into PJM must qualify for one of the RPS policies within the PJM region and be located in states "adjacent to PJM geographical boundaries."

For example within PJM, the District of Columbia allows generators within PJM and generators within states that are adjacent to PJM to trade RECs freely.[43] Generators in adjacent control areas, such as NYISO and MISO, can also participate in the RPS program, as long as the energy that corresponds to the renewable energy attributes is imported into PJM. The DC RPS statute reads: "Renewable energy credit" or "credit" means a credit representing one megawatt-hour of electricity consumed within the PJM Interconnection region that is derived from a tier one renewable source or a tier two renewable sources that is located:

1. In the PJM Interconnection region or in a state that is adjacent to the PJM Interconnection region; or
2. Outside the area described in subparagraph (1) of this paragraph but in a control area that is adjacent to the PJM Interconnection region, if the electricity is delivered into the PJM Interconnection region

[43] Ibid.

DC passed its RPS legislation recently in April 2005 and as of this writing regulations have not been finalized, nor has DC officially selected an attribute tracking system, although it's very likely that the DC Public Service Commission will elect to use PJM GATS. DC is potentially promising for New Jersey customers seeking to sell solar RECs outside of the New Jersey system as DC is the only other state in the region that has a separate solar carve-out for their RPS. Similar to the SACP for New Jersey, DC also has a compliance penalty of $300 for failing to meet the solar carve-out requirements. This will create a price ceiling for the Solar RECs sold in DC and raise their value above the other RECs which have a penalty of only $50.[44]

E. Clean Energy Fund Rebates and Other Renewable Incentive Programs

The New Jersey Clean Energy Program offers a series of financial and technical assistance programs to help the public and private sectors adopt alternative energy technologies. The main programs target different potentially interested groups:

Customer Onsite Renewable Energy (CORE) program[45]

The program rebates up to 60% of the installed cost for renewable energy systems such as solar, wind, and sustainable biomass systems. Specific rebate amounts for PV systems are detailed in Table 1 below. To participate in the Customer Onsite Renewable Energy program, one must install an on-site solar electric, sustainable biomass, fuel cell, or a wind energy generation system in New Jersey. There is no maximum installation size, but the system must be sized to meet the site's specific electricity needs. Eligible systems should be sized to produce no more than 100% of the historical or expected (if new construction) amount of electricity consumed at the system's site. Previous rules allowed system output to generate up to 125% of annual electric use. Solar electric array orientations proposed for CORE rebate must achieve a calculated system output of at least 80% of the default output estimated by PVWATTS, a performance calculator for grid-connected systems. Researchers at the National Renewable Energy Laboratory developed PVWATTS to permit non-experts to quickly obtain performance estimates for grid-connected PV systems within the United States and its territories.

Table 4: New Jersey Rebates for Solar Electric Systems[46]

2006	All Private Sector Applicants effective 3/15/06	All Public and Non-profit Applicants effective 3/15/06
0 to 10,000 Watts	$4.35/Watt	$5.15/Watt
10,001 to 40,000 Watts	$3.20/Watt	$4.15/Watt
40,001 to 100,000 Watts	$3.00/Watt	$3.50/Watt
100,001 to 700,000 Watts	$2.80/Watt	$3.40/Watt

[44] Ibid.
[45] New Jersey Board of Public Utilities, Office of Clean Energy. Clean Energy Programs website accessible at http://www.njcep.com/
[46] Ibid.

Financial incentives are applicable exclusively for:

- New Jersey Ratepayers (customers of NJBPU-regulated electric or gas public utilities)
- Systems with new components
- Systems installed in New Jersey homes, businesses, institutions or non-profit facilities
- Systems that include at least a 5-year, all-inclusive warranty
- Systems installed according to the Installation Requirements specified in the Clean Energy Program's Technical Worksheet

The Board has established CORE Program budgets for each of the following types of projects:

- Non-public (private) less than or equal to 10 kW
- Non-public (private) greater than 10 kW
- Public – Schools
- Public – Other

When sufficient funds do not exist in any of these budget categories, the Office of Clean Energy places complete applications in queue. Rebate approval letters for projects placed in queue are issued when additional funds become available either through project attrition, line item budget reallocation, or other sources. If sufficient funds exist in a category, the Office of Clean Energy processes rebate applications and issue rebate approval letters for complete applications in the order they are placed in the queue. Projects under 10 kW must be completed in 9 months with no extensions and those larger than 10 kW must be completed in 12 months but may apply for an extension.

Renewable Energy Project Grants and Financing Program[47]

This Program, formerly the Renewable Energy Advanced Power Program, provides grants and financing to encourage the development of large-scale renewable energy facilities, greater than 1 MW, in New Jersey. The solicitation is designed to provide seed grants and access to capital in order to make renewable powered electricity cost competitive with conventional power plants.

Renewable Energy Business Venture Assistance Program[48]

Formerly known as the Renewable Energy Economic Development Program (REED), this program provides funding for renewable energy businesses in New Jersey. Grants were intended to promote renewable energy business development in the state. For the 2004 Renewable Energy Business Venture Assistance solicitation, $6.35 million in recoverable grant funds were made available. In 2005, $5 million was made available for demonstration projects and recoverable grants. Unlike the Renewable Energy Project Grants and Financing Program, this program is for locating renewable energy companies and their manufacturing facilities within New Jersey.

New Jersey Economic Development Financing Programs[49]

Two new financing programs to be managed by the NJ Economic Development Authority were implemented in 2005: Public Entity Financing for Schools and Local Governments and Clean

[47] Ibid.
[48] Ibid.
[49] Ibid.

Energy Project Financing for Businesses. These programs, which require energy efficiency improvements in conjunction with the use of renewable energy technologies, will provide grants and low-cost financing to supplement the direct financial incentives provided through the other programs.

F. Selling Renewable Energy Back to the Utility

Net-metering is defined in New Jersey as a system of metering electricity in which the electric distribution company credits a customer-generator at the full retail rate for each kilowatt-hour produced by a Class I renewable-energy system installed on the customer-generator's side of the electric revenue meter, up to the total amount of electricity used by that customer during an annualized period.[50] In New Jersey, *Class I renewable energy* means electricity generated by solar technologies, wind, fuel cells, geothermal technologies, wave or tidal action, and methane gas from landfills or a biomass facility. New Jersey’s net metering provisions apply to systems up to a maximum capacity of 2 MW. Customers eligible for net metering also retain ownership of the RECs associated with the electricity they generate.

More explicitly state statutes define net-metering as meaning “a system of metering electricity in which the electric distribution company:

1.) Credits a customer-generator at the full retail rate for each kilowatt-hour produced by a Class I renewable energy system installed on the customer generator’s side of the electric revenue meter, up to the total amount of electricity used by that customer during an annualized period; and
2.) Compensates the customer-generator at the end of the annualized period for any remaining credits, at a rate equal to the supplier/provider's avoided cost of wholesale power.”[51]

Currently, the use of the term “customer-generator” has been interpreted so that in order for a customer to get credit for the electricity generated, it must be behind the customer’s meter. An additional restriction is that the electricity must be used to meet the customer’s need and not to exceed it in order to solely sell back to the grid.

VI. Impacts of Recent Clean Energy Policies

A. New Jersey 20% RPS by 2020 Impact Analysis[52]

In April of 2003, the New Jersey Governor’s Renewable Energy Task Force recommended that the existing Class 1 RPS be increased to 20% by the year 2020 from the existing level of 4% in 2008. This recommendation was ultimately adopted by the NJ BPU and is discussed in more detail earlier. Prior to considering this increase the NJ BPU decided to engage CEEEP to conduct

[50] New Jersey Board of Public Utilities. “Renewable Portfolio Standards (RPS) Rules Adoption,” N.J.A.C. 14:8-2, April 13, 2006.
[51] Ibid.
[52] Center for Energy, Economic & Environmental Policy (CEEEP). “Economic Impact Analysis of New Jersey’s Proposed 20% Renewable Portfolio Standard,” December 8, 2004, available at http://policy.rutgers.edu/ceeep/events_new.html

an economic impact analysis of increasing the RPS to 20% in 2020 (proposed 20% RPS) compared to the existing RPS. CEEEP enlisted the participation of the Rutgers Economic Advisory Services, and formed an interdisciplinary team to perform this analysis.

Increasing the amount of electricity sold in the state that is generated by renewable technologies would increase the cost of electricity. This additional cost would, in theory, reduce the expected growth rate of the state's economy. On the other hand, reducing emissions from fossil fuel generation, primarily at plants fired by natural gas, would reduce harmful emissions and provide a benefit by avoiding the associated costs due to those emissions. Increasing the RPS would, if combined with the state's economic development policies, also attract jobs in the renewable sector of the economy. It would also provide some price pressure on the cost of natural gas, might avoid some transmission and distribution expenditures, and increase reliability for those facilities with solar photovoltaic (PV) panels.

Projecting the future over a period of 15 years is a difficult exercise and requires making assumptions regarding many key parameters that are inherently uncertain. The analysis contained in the RPS report constructed several different scenarios regarding expected fuel prices and technological improvements. The base case assumed increasing real fuel prices and expects technological improvements that lead to cost reductions based on the renewable market assessment that is part of this project.

The costs of requiring additional renewable resources beyond the existing standard are relatively easy to quantify compared to the benefits of such a policy. There is a large degree of uncertainty within the proposed 20% RPS of quantifying benefits. Those benefits are primarily but not exclusively avoided environmental costs. Nonetheless, the wide range in available estimates of benefits should not be construed as implying that these benefits are "less real" than the costs. Clearly, policymakers must consider the associated uncertainties of both the costs and benefits in their deliberations.

Under the base case, the proposed 20% RPS compared to the existing RPS would raise electricity prices approximately 3.7% by the year 2020 but have a negligible impact on the growth of New Jersey's economy. Under the proposed 20% RPS, the location in New Jersey of all of the manufacturing, operations, and maintenance facilities and employees needed to support the PV and wind infrastructure would add approximately 11,700 jobs and augment the economic benefits to the New Jersey economy in the year 2020. The proposed 20% RPS would cause natural gas prices to edge slightly downward for New Jersey consumers by reducing the use of this fuel in power generation. Finally, the proposed 20% RPS would increase reliability by providing electricity from PVs when the grid power is not available and may reduce expenditures on transmission and distribution (T&D) within the state.

The economic and electricity price impacts of the proposed 20% RPS, however, depend substantially on whether expected technological improvements and other factors occur that reduce the cost of PVs and wind power. For instance, if additional cost reductions do not exceed the pace of those that have historically occurred to date in PV and off shore wind technologies, the proposed 20% RPS would raise electricity prices by approximately 24% in the year 2020 and have a measurable, negative impact on the state's economy.

The proposed 20% RPS would also reduce the emission of many pollutants in the region. The marginal fuel in the region used to generate electricity is primarily natural gas, and a proposed 20% RPS avoids the emission of many major air pollutants from natural gas powered plants. Quantifying in dollars the incremental avoided cost of the proposed 20% RPS requires many assumptions, New Jersey specific data, and extensive modeling. Using estimates of externality "adders" - estimates of the additional costs due to emissions - that are found in the literature, illustrative calculations suggest that the avoided costs due to a proposed 20% RPS are in the range of several hundred million dollars in 2020.

The amount of the environmental benefits also depends on the policy interaction between the proposed 20% RPS and existing environmental policies. For instance, under the emission cap and trade programs for sulfur dioxide (SO2) and nitrogen oxides (NOx), these environmental externalities are internalized. Additional policy measures are needed in conjunction with the proposed 20% RPS to maximize its environmental benefits.

New Jersey policymakers should consider certain initiatives in order to maximize the benefits of the proposed 20% RPS, including taking measures to coordinate with other states and the federal government and to promote measures that lead to the anticipated decline in the costs of renewables.

B. Final Report of the Governor's Wind Commission[53]

On 23 December 2004, former Governor Richard J. Codey issued his twelfth executive order establishing a 15-month moratorium on the funding and permitting of wind turbine facilities in New Jersey's coastal waters. Executive Order 12 also created a nine-member Blue Ribbon Panel, author of this report. This Panel comprises six public members representing environmental, academic, tourism, and local government interests. Additionally, the Environmental Protection Commissioner, Board of Public Utilities President, and Commerce Commission CEO & Secretary each serve as ex officio voting members.

Executive Order 12 tasked this Panel with three distinct charges:

1. Identify and weigh the costs and benefits of developing offshore wind turbine facilities, considering both economic and environmental costs and benefits;

2. Consider the need for offshore wind turbines and a comparison to other electric power sources, including fossil, nuclear and renewable fuels as part of the state's long-term electricity needs, and

3. Submit to the governor a report providing policy recommendations regarding the appropriateness of developing offshore wind turbine facilities.

The Wind Commission's final report, including the enclosed specific policy recommendations, were intended to satisfy the third charge set out by Executive Order 12 (Codey), that the Panel

[53] Blue Ribbon Panel on Development of Wind Turbine Facilities in Coastal Waters. "Final Report to Governor Corzine," April 2006, available at http://www.njwindpanel.org/docs/finalwindpanelreport.pdf

submit to the Governor a report providing policy recommendations regarding the appropriateness of developing offshore wind turbine facilities.

The Final Report's findings were as follows:

- New Jersey faces a serious and growing energy crisis that cannot be ignored.
- New Jersey must be a leader in developing clean, renewable sources of energy.
- New Jersey must face its energy problems with bold action on multiple fronts.
- Based on information available today, offshore wind turbine technology offers a range of potential benefits and possible drawbacks.
- Too much remains unknown to characterize the appropriateness of offshore wind development for New Jersey's coastal waters.
- Some of the unknown and/or incomplete information can be learned through practical application of the technology.

Recommendations

1. To protect the state's economic and environmental resources, ensure sound planning for use of the offshore area, and inform development of federal rules regulating such use, New Jersey should adopt this Panel's findings and recommendations as an affirmative statement of policy.
2. New Jersey's Board of Public Utilities should incorporate this Panel's findings and recommendations into its forthcoming Energy Master Plan.
3. The Commerce, Economic Growth & Tourism Commission should undertake a consumer intercept opinion survey summer 2006 to collect data necessary to quantify visitors' primary reasons for travel to New Jersey and measure the attitudes of these visitors to the sight of offshore wind turbines at various distances offshore.
4. The state should conduct baseline studies of New Jersey's coastal waters to inform federal rules regulating use of such areas, to develop spatial and temporal information regarding ocean uses and living natural resources, and to assess tourism and related economic sectors.
5. While this Panel has identified an absence of information regarding the various possible impacts of offshore wind turbines, it believes the potential of the technology as a renewable energy source should be explored further. Following collection of baseline data, this should be done through a carefully monitored and tightly controlled test project.
6. Planning for a test project must proceed with caution; its development must be preceded, accompanied, and followed by collection and analysis of scientifically valid data and monitoring of environmental and economic impacts of the project. These data should be used to determine if future development is necessary and/or appropriate. No further offshore wind development should proceed until these data have been studied for consistency with the guiding principles developed by this Panel and the coastal policies of this state.

The Blue Ribbon Panel identified various costs and benefits related to development of offshore wind turbine facilities in New Jersey's coastal waters. However, it found that because of the lack of basic scientific data, it could not characterize the appropriateness of offshore wind development for this state's coastal waters. Nonetheless, the Panel has found that New Jersey is facing a serious and growing energy crisis that must be addressed. New Jersey must assume a leadership role and set an example of responsible development of energy technologies that are reliable, renewable, and low or zero-emission.

In light of recent notice that a federal regulatory program governing energy uses over the continental shelf will be developed, New Jersey should anticipate that a determination regarding development of offshore wind facilities will be made—with or without New Jersey's input—within this federal process. The state should act immediately to collect information necessary to establish a permitting program that protects New Jersey's economic and environmental interests.

Despite a lack of adequate information on the potential impacts of offshore wind turbine facilities, this Panel believes such technology should be explored for inclusion as part of the solution to New Jersey's energy problems. It is expected that a carefully planned, executed and limited offshore wind test project will yield important information currently unavailable. Development of such a project would serve not only as an investment in an innovative source of renewable energy, but also as an investment in knowledge that will guide New Jersey as it continues to address population growth and increased energy demand, while balancing the need to protect its economy and ecologically valuable natural and wildlife resources.

C. Overview of the Regional Greenhouse Gas Initiative (RGGI)[54]

As part of the Regional Greenhouse Gas Initiative (RGGI), nine Northeastern and Mid-Atlantic states are in the process of drafting a model rule that would implement a carbon dioxide cap-and-trade system covering the generation of electricity. The use of cap-and-trade programs regulating other air emissions have been generally acknowledged as being successful in reducing other emissions, such as sulfur dioxide and nitrogen oxide, in a cost-effective manner.

The economic success of cap-and-trade programs stems from the fact that they allow sources that would incur high costs in reducing their emissions to purchase allowances from those that can curtail their emissions at low costs. Environmental policy objectives are assured because the total amount of emissions is capped; they are achieved efficiently because participants are able to trade, and therefore reductions tend to come from those that can achieve them in the most cost-effective manner.

CO_2 is an ideal emission to be regulated under a cap-and-trade approach. The location and timing of CO_2 emissions do not affect the associated impact those emissions have on global warming, which simplifies design and greatly limits the potential for trading to prove environmentally harmful. Compliance with the cap is assured simply by monitoring emissions and ensuring that each source holds allowances equal to its emissions.

All cap-and-trade policies require the distribution of emission allowances to jump-start the program. Holders of an emission allowance have the right to emit one ton of CO_2. Whatever allocation method policymakers select, it is a critical decision because it affects the profitability

[54] CEEEP for the New Jersey Board of Public Utilities. "Evaluation of CO2 Emission Allocation as part of the Regional Greenhouse Gas Initiative (RGGI)," June 20, 2005, available at http://policy.rutgers.edu/ceeep/events_new.html.

of generation resources, the cost of electricity, and future power plant investment decisions. In addition, those who receive an allocation are in effect receiving the monetary value of the emission allowances. Collectively, the allowances are worth several times more than the social cost of mitigating CO_2 to meet the cap. For example, if CO_2 allowances sell at $10/allowance and 100 million are issued, the value of the allowances is $1 billion, although the social cost of mitigation may be only in the several hundreds of millions of dollars.

VII. Overview of United States Energy Policy Act of 2005[55]

On August 8, 2005, President George W. Bush signed into law the Energy Policy Act of 2005 (Act). The Act is the most comprehensive piece of legislation affecting the nation's energy industry and markets since passage of the Energy Policy Act of 1992. The major goals of the Act are to foster energy efficiency, to maximize development and use of domestic energy resources, including renewable energy resources, and to lessen the nation's dependence on foreign oil. Hence, the Act contains provisions designed to make America's homes, offices, buildings, automobiles and machinery more energy efficient, to increase the production of domestic coal, oil and gas supplies, to promote the development and use of renewable energy resources, to encourage the construction of new nuclear power plants and develop "next generation" nuclear facilities, and to provide incentives to the nation's electric utility and natural gas industries to construct facilities that will foster open and efficient electric and gas markets.

Congress also used the Act to respond to the meltdown of the California energy market in 2000, the collapse of Enron, and the 2003 Northeast Blackout. To address these issues, Congress enhanced the ability of the Federal Energy Regulatory Commission (FERC) to regulate the sale and transmission of natural gas and electricity, gave the FERC new tools to ensure transparency in wholesale gas and electricity markets and to punish market manipulation, and took action to enhance investment in, and reliability of, the nation's electric transmission grid. Finally, the Act contains a variety of new tax incentives designed to encourage investment in energy facilities and the development of projects that Congress deems necessary to fulfill the goals of the Act.

<u>Renewable Energy:</u> The Act provides incentives to develop and use renewable energy resources, including geothermal, hydroelectric, and biomass resources.

- Amends the Energy Policy Act of 1992 to extend payments to certain qualified renewable energy facilities (including landfill gas, livestock gas and ocean resources owned by a State, a subdivision of a State, or a non-profit cooperative) used to generate electricity.
- Imposes a renewable energy requirement on the federal government by requiring the DOE to ensure that, to the extent economically feasible and technically practicable, the total amount of electric energy the federal government consumes during any fiscal year includes not less than three percent renewable energy in years 2007 through 2009; not less than five percent in years 2010 through 2012; and not less than seven and one-half percent in year 2013 and each year thereafter.

[55] Energy Policy Act of 2005. Public Law 109-58, 119. August 8, 2005. Statute 594.

- Establishes a photovoltaic energy commercialization program for procuring and installing photovoltaic solar electric systems for electric production for use in new and existing public buildings.
- Establishes economic incentives for the use of renewable energy systems in dwelling units or small businesses.
- Establishes grants to improve the commercial value of forest biomass for electric energy, useful heat, transportation fuels, and other commercial purposes.
- Amends the Geothermal Steam Act of 1970 to encourage the use of geothermal resources. The Act, among other things, changes the leasing and lease procedures for geothermal resource purposes, as well as the royalty fee structure for use of geothermal resources on federal lands.
- In an effort to increase electrical output at existing hydroelectric facilities, the Act establishes incentive payments for hydroelectric generating devices that (1) are owned or operated by a non-federal entity that generates hydroelectric energy for sale and (2) is added to an existing dam or conduit.
- Requires the DOE to publish a report by early August 2006 that contains a detailed inventory describing the available amount and characteristics of renewable energy resources within the United States as well as other information that would be useful in developing renewable energy resources.
- Extends to December 31, 2007, the “placed in service” deadline for facilities to qualify for tax credits for electricity produced from certain renewable sources under Internal Revenue Code Section 45. This two-year extension applies to wind, closed loop biomass, open-loop biomass, geothermal, small irrigation power, landfill gas, and trash combustion facilities. The deadline was not extended for solar facilities.
- Expands the list of sources qualifying for Section 45 credits to include incremental hydropower, new units at existing trash combustion facilities, coke and coke gas facilities, and coal owned by Indian tribes.
- Authorizes the issuance, before December 31, 2007, of $800 million of tax-credit bonds (i.e., bonds that give tax credits to their holders instead of interest) to support renewable energy investments by municipal power authorities, rural cooperatives and others.

<u>Energy Efficiency:</u> The Act seeks to promote energy efficiency through creation of new federal programs, the production of energy efficient products, and through the use of renewable fuels and energy efficient products in public buildings.

<u>Electricity:</u> To ensure the reliable operation of the nation’s bulk-power grid, the Act creates a reliability organization, provides incentives to the construction of new transmission facilities, and gives the FERC authority to order the construction of certain transmission facilities. The Act also repeals the Public Utility Holding Company Act of 1935 (PUHCA), amends major provisions of the Public Utilities Regulatory Policies Act of 1978 (PURPA), expands the FERC’s merger review authority, increases civil and criminal penalties under the Federal Power Act (FPA) and gives the FERC new tools to ensure transparency in, and deter manipulation of, the wholesale electric market.

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