NEW JERSEY ENERGY MASTER PLAN

OCTOBER 2008

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EXECUTIVE SUMMARY

Energy plays a vital role in the health of New Jersey's economy and environment. Families who are barely getting by paycheck to paycheck cannot bear ever-increasing energy bills; businesses need reliable supplies of energy at affordable and predictable prices to remain competitive. The production, distribution and use of energy, unless wisely managed, can threaten the economy of this State, the quality of our air and water and the health of our residents.

This Energy Master Plan (EMP or Plan) proposes a road map to guide us toward a responsible energy future with adequate, reliable energy supplies that are both environmentally responsible and competitively priced. Building that future will require not only long-term actions, but also immediate investments that will help to ease our energy costs in the short term, create jobs, grow clean energy businesses, and establish the clean energy industry as a cornerstone of the State's economy.

Implementing this plan will place New Jersey at the forefront of a growing clean energy economy with aggressive energy efficiency and renewable energy goals and action items, and the development of a 21st century energy infrastructure. It will also result in less volatility of energy prices and a reduction in overall energy expenditures for all consumer classes.

Planning for this more responsible future must begin with understanding our current energy environment and challenges, and understanding what the future will look like if we continue on our current path. The consequences of our current path will result in an energy environment that will be less reliable, environmentally irresponsible, and will threaten to undermine economic growth in the State.

The energy environment is very different for electricity, for heating fuels, and for transportation. The challenges and potential solutions for each of these energy sectors are very different, and warrant separate discussions. Therefore, this plan focuses on the challenges and potential solutions to the electricity and heating fuels sectors, while energy needs for transportation will be addressed in the Department of Environmental Protection's (DEP) report under the Global Warming Response Act.

To develop the energy picture of the future, the State worked with the Center for Energy, Economic, and Environmental Policy (CEEEP) and the Rutgers Economic Advisory Service of the Center for Urban Policy Research (R/ECON™) in the Bloustein School at Rutgers University, to model what our energy circumstances would look like in 2020 (see www.nj.gov/emp). The modeling included a "business as usual" scenario that assumed no major changes in state policies and actions, as well as an "alternative scenario" reflecting changes outlined in this Plan. The modeling outlines how "business as usual" and the "alternative scenario" could affect energy use, economic growth, air quality, and greenhouse gas emissions.

"BUSINESS AS USUAL" SCENARIO

The "business as usual" model includes no action by the State other than the policies already in place to address the following energy challenges:

CHALLENGE 1: Growth in the supply of electricity has not been keeping up with the growth in demand.

Our ability to maintain reliable, competitively priced supply is threatened by the fact that we have, over the past decade, consistently and dramatically increased our electricity demands at a time when the resources needed to supply this demand have consistently been reduced. A reliable supply of electricity requires power plants with enough capacity to meet the peak demand for electricity, transmission lines with enough capacity to carry that electricity from power plants to areas where customers are concentrated, and distribution systems with enough capacity to take the electricity from the transmission system and deliver it to customers. However, demand rises to peak levels for only a small number of hours each year – generally fewer than 50 hours out of 8,760. Building power plants and transmission lines to serve growing peak demand is far more costly than reducing demand during those few hours.

Larger homes, more computers, plasma televisions, and other devices have grown our demand significantly and are likely to continue to fuel higher demand that are not matched by growth in the capacity to satisfy that demand. Between 2002 and 2007, electric generation capacity in New Jersey increased annually at an average rate of 0.71%. Peak demand is expected to keep growing faster than supply has grown. PJM Interconnection, which operates the regional transmission system and administers regional wholesale electricity markets for a 13-state area stretching from New Jersey to Illinois and North Carolina, projected in January 2008 that peak demand in New Jersey will continue to grow from 2008 through 2018 at an annual rate of about 1.75%. This projected growth in peak demand is about 2-1/2 times as fast as supply has grown in recent years.

In addition, regional pressures on our energy supplies exacerbate the gap between supply growth and demand growth. Because of the deregulation of the wholesale markets and creation of a class of merchant generators, competitive pressures entice generation companies to sell their power into the most lucrative markets. For power plants located in New Jersey, the Metropolitan New York markets are attractive because of the higher prices for power that may be obtained there. Therefore, a trend appears to have begun in which new transmission lines are constructed to export needed power from New Jersey into New York. One such project currently exports about 660 megawatts (MW) of electricity from Sayreville to Long Island – equivalent to about 4% of our generation capacity. Additional planned "extension cords" to New York have been proposed which, if constructed, could withdraw more than 2000 MW of additional capacity from New Jersey over the next several years.

Retirements of aging power plants put us even further behind. Less than 40 percent of New Jersey's generation capacity is 20 years old or less, while more than half is 30 years old or older. Much of that older capacity is expected to retire during the period covered by this plan, especially the plants that are less reliable, less efficient, more expensive to run, and with greater greenhouse gas emission rates than newer capacity.

CHALLENGE 2: The price of energy has increased substantially over the past few years, has become increasingly volatile, and these trends are expected to continue.

Between 2002 and 2007, the price of natural gas nearly doubled, driving corresponding increases in the price of electricity and heating fuels in New Jersey. That increase is reflected in the price of electricity in the auctions held by New Jersey electric utilities since 2002, to procure a supply of electricity for virtually all of the residential and virtually all but the largest commercial and industrial customers. Between 2002 and 2007, the price resulting from that auction nearly doubled, from 5.06 cents per kilowatt hour in 2002 to 9.94 cents in 2007, and increased further to 11.33 cents in 2008.

For several reasons, New Jersey electricity prices are expected to continue increasing. Most importantly, New Jersey's electric generation fleet has changed over time, to become more reliant on power plants fueled by natural gas, which are more expensive to operate than plants using cheaper fuels. In 1990, power plants fueled by natural gas accounted for about 33% of New Jersey's electric generation capacity; by 2006, that share had grown to about 55%. In contrast, nuclear plants, which generate electricity at a much lower cost for each megawatt-hour, provided 26.6% of capacity in 1990 but only 21% in 2006. In addition, these increases in electricity prices have been compounded more recently by increases in the price of coal.

In addition to the increased reliance on natural gas-based electricity, a recent change in the wholesale electricity markets is fueling further price increases. Electricity suppliers serving retail customers must purchase the right to call on enough generation to meet their customers' peak demand, plus a reserve. The customers bear the cost of purchasing these capacity rights. In response to a flawed capacity market, PJM has implemented a new capacity market structure known as the Reliability Pricing Model (RPM), developed by PJM and approved by the Federal Energy Regulatory Commission (FERC). The first five years of RPM will cost New Jersey electricity customers more than $7 billion, or about 15-20% of each customer's bill. The purpose of this capacity market is to encourage the development of more generation capacity in regions with increased electricity demand. Most of the RPM revenue has gone to existing power plants, which has resulted in the re-powering of some plants and the reactivation and postponement of retirement for other plants. It has also resulted in new plans for generation investment in New Jersey. However, this has severely diluted any incentive that new plants could receive which would result in significant capacity increases.

Fossil fuels are used not just to generate electricity, but also to heat homes and businesses and to supply manufacturing processes. Our vulnerability to problems in the supply and price of these fuels has been demonstrated again and again. Over the past few years,

natural gas prices spiked dramatically after Hurricanes Katrina and Rita disrupted supplies in 2005. Over the longer term, the use of natural gas for electric generation has increased, which further increases our demand and our vulnerability to price instability.

The price of oil has also been rising, as some of the world's leading oil-producing regions find them in turmoil. This dependence on these nations to supply our growing energy demands, has added increased concerns about supply, and resulted in enormous increases and swings in the costs for oil and natural gas. The price of oil, which was about $55 per barrel at the beginning of 2007 and below $20 per barrel as recently as 2002, exceeded $140 per barrel this July and finished September at close to $100 per barrel.

CHALLENGE 3: Without action, our contribution to global warming and other pollutants will continue to increase.

A major part of New Jersey's efforts have focused on the power plants that supply New Jersey's electricity, from within and from outside the state. Those plants account for about a quarter of our greenhouse gas emissions.

Some efforts to preserve the reliability of our electricity supplies threaten to undermine the State's work on global warming. PJM has determined that the reliability of our supply of electricity will be jeopardized over the next several years, unless steps are taken to address the state's electricity demand and supply. Since PJM is responsible for planning and operating the transmission grid reliably, it is in the process of directing upgrades to the grid that will enable New Jersey to import more electricity. These imports do supply an opportunity to increase reliability and increase access to clean forms of electricity generation across the PJM territory. However, given the current electricity picture in the PJM territory, much of these electricity imports would come from coal power production and would result in an increase in our contribution to global warming. In other words, our efforts to cut greenhouse gas emissions within New Jersey's borders will be undermined if the shortage of electricity supply is solved by simply importing more out of state based electricity.

The prospect of increased greenhouse gas emissions is only one reason to avoid increasing our reliance on imports of out of state dirty electricity. Just as importantly, hopes that these imports would bring us greater reliability and lower prices are likely to be dashed. The prospect of federal limits on power plant emissions of greenhouse gases is creating major uncertainty about what coal-based power will cost. In addition, demand for coal is increasing, as coal is becoming more difficult and expensive to mine and transport, and recent history has featured disruptions in coal supply and spikes in coal prices. All of these factors suggest that it would be irresponsible to stake our energy future on increased imports of out of state coal-based electricity.

CHALLENGE 4: The State has much less authority over the supply and price of electricity than it used to.

Until 1999, electric utilities planned, built, owned and operated most of the electric generation capacity in the State, under the oversight of the New Jersey Board of Public Utilities (BPU). State and federal laws changed that, with the goal of opening

competitive markets in electricity. As part of this restructuring of the New Jersey electric industry, the electric utilities have divested their generation assets to third parties or to a utility affiliate and the BPU no longer regulates the generation of power.

As a result of these changes, no single entity is empowered to plan the generation, transmission, sale, and use of electricity. PJM, the FERC, generation companies, electric utilities, the financial community, State and federal environmental regulators, and the BPU now share a complex web of often uncertain, conflicting and overlapping decision-making. Along with the diffusion of planning responsibilities and dependence on market forces, we have seen that new generation capacity is not getting built at nearly the pace needed to keep up with growing demand. A spurt of new power plants from the mid-1990s into the early part of this decade has been followed by an almost total absence of new plants, while demand has continued growing unabated. The transmission solutions which PJM and FERC propose ignore the economic and environmental concerns which face New Jersey.

The term "Energy Master Plan" stems from State law enacted in the 1970s, when none of these changes were foreseen. The term now seems almost quaint, implying a much more direct ability to plan and implement our energy future than we actually have. This plan realistically focuses on actions within the State's control to bring us a future of reliable and competitively priced supplies of electricity and heating fuel consistent with our environmental needs, and actions to influence other decision-makers to do their part in making that vision a reality.

CONSEQUENCES: If nothing is done to address these challenges, the "business as usual" scenario, the State will consume 97,800 GWh of electricity and 542 trillion BTUs of natural gas or heating oil. This total energy consumption will cost customers more than $30.7 billion in 2020, which is 96% more than the total annual energy expenditures in 2005. Greenhouse gas emissions would increase, with carbon dioxide emissions totaling 84 million metric tons in 2020, about 7% more than the 2005 levels. The 2020 greenhouse gas target requires greenhouse gas emissions to be at 1990 levels by 2020 or 72.8 million metric tons for the electricity and heating sectors.

The economic, reliability, and environmental consequences of the "business as usual" scenario are unacceptable. Actions must be implemented to ensure that New Jersey's future energy environment provides energy that is competitively priced, reliable and consistent with the 2020 and 2050 greenhouse gas targets.

ALTERNATIVE SCENARIO

In response to the energy challenges currently facing the State, there is an opportunity for New Jersey to redesign its energy system while establishing a clean energy industry as a major part of our economy. Strong, thoughtful actions that help us to use energy more efficiently, to reduce the growth in our peak demand for energy, and to produce more clean energy locally can lead us to a better future than what "business as usual" offers. Together, these efforts will result in the creation of New Jersey based jobs to implement

the action items of this plan, and it will effectively reduce the total energy expenditures for all customer classes in New Jersey.

The following goals and action items provide a road map to achieve a more responsible energy future:

GOAL 1: Maximize energy conservation and energy efficiency.

Reducing energy consumption through conservation and energy efficiency is the most cost-effective way to help close the gap between supply and demand, lower energy costs, increase reliability, and lower the state's contributions to global warming and other air pollutants. Reducing energy consumption at least 20% by 2020, as Governor Corzine has directed, would yield annual electricity savings of nearly 20,000 GWh per year and annual heating savings of nearly 110 trillion BTUs. This reduction in energy consumption will result in significant cost savings, and thereby fuel economic growth in the state. Actions to achieve that reduction include the following:

- Transition the State's current energy efficiency programs to be implemented by the electric and gas utilities, and achieve the desired results while remaining cost-effective. These programs will emphasize a whole building approach to energy efficiency, and this transition will begin upon release of this plan.
- Increase energy efficiency in new buildings with a statewide building code that will make new construction at least 30% more energy efficient than buildings under current State code by the end of 2009.
- Increase energy efficiency in existing buildings through enhanced energy efficiency standards for new appliances and other types of equipment currently not covered by existing standards beginning in 2009.
- Increase awareness about the importance of energy conservation and energy efficiency upgrades by developing an education and outreach program for the public. This will result in a shift in the way the state's consumers think about, and use energy.

GOAL 2: Reduce peak electricity demand.

Supplying electricity during the hours of peak demand is much more expensive, due to the need to call upon more expensive sources of generation, than electricity supplied during times of non-peak demand. During these times, wholesale electricity prices may increase by anywhere from 100% to 1,000%. While energy efficiency and conservation help reduce our overall use of electricity, with some of that reduction reducing the peak, specific actions that encourage people to use less electricity specifically during times of peak demand can substantially reduce electricity prices during. Therefore, the following action items are recommended, in addition to the energy efficiency and conservation measures listed above, that will decrease peak demand by 5,700 MW by 2020:

- Expand incentives for participation in regional demand response programs.
- Involve electric utilities in developing and implementing demand response programs. Where possible, these efforts will be coordinated with the energy efficiency efforts of the utilities.
- Target all commercial and industrial customers with a peak demand of 500 kW or greater for reduction in peak demand and continue to develop incentives that

achieve significant peak demand saving. The BPU's Office of the Energy Ombudsperson will be responsible for the targeting of these customers, and the BPU staff will also consider alternative rate structure designs that will assist in achieving the demand response goals articulated in this plan.

- Pilot different technologies (including advanced metering infrastructure) and rate structures for residential customers and customers with a demand of less than 500 kW. Currently, the technologies and rate structures necessary to achieve peak demand reductions for these customers remain largely unproven. Therefore, using data from pilots in New Jersey and other states, the necessary technologies and rate structures will be identified that result in real peak demand reductions while remaining cost effective to the rate payers.
- Monitor the results of all demand response initiatives through 2012 and implement the most effective mix of action steps to achieve a total peak demand reduction of 5,700 MW by 2020.

GOAL 3: Strive to exceed the current RPS and meet 30% of the State's electricity needs from renewable sources by 2020.

Renewable energy provides the State with an opportunity to produce electricity that does not contribute to greenhouse gas emissions, and relies on renewable and most of the time free fuel sources such as wind and solar. Since most renewable generation is currently more expensive to build than conventional generation, some financial help is needed to get renewable generation built. The State's Renewable Portfolio Standard (RPS) provides some help, by increasing the monetary value of renewable power. Under regulations already in place, the RPS requires that renewable energy sources generate 22.5% of the State's electricity consumption by 2020.

However, the action items in this plan and the continuing improvement in renewable energy technologies make it possible to exceed this goal, allowing the State to set its sights on a 30% goal by 2020. This renewable electricity supply will come from 900 MW of biomass capacity, at least 3000 MW of offshore wind capacity, 200 MW of onshore wind capacity, and 2,120 GWh (approximately 1,800 MW) of solar energy production. These action items include:

- Change the solar energy goals from a percentage of 2.12% to a goal of 2,120 GWh by 2020. This will ensure that reductions in energy consumption, as a result of this plan, will not suppress the development of solar energy development in the State. The percentage requirement, given the energy reduction targets articulated in this plan, would result in approximately 1300 MW of solar energy capacity installed, compared to 1800 MW with the revised GWh goal.
- Develop New Jersey's wind energy resources, including at least 1000 MW of offshore wind by 2012, 3000 MW of offshore wind and at least 200 MW of onshore wind by 2020. An Offshore Wind Planning Group will be created to spearhead this effort.
- Develop 900 MW of biofuels and biomass, not involving incineration, as part of the State's 2020 RPS.
- Increase support for other renewable energy technologies including a 50 MW carve out for "new and emerging technologies."

- Increase the RPS for the years 2021 to 2025.

GOAL 4: Develop a 21st century energy infrastructure.

We must recognize that improvements to our energy infrastructure may be necessary to support the goals and action items in this plan, while ensuring the reliability of the energy system. The increases in distributed generation, shifts in peak demand and other changes to consumer behavior will alter the demands of the current energy infrastructure. These changes require the State to work with the utilities to ensure that the foundation, on which these actions will rest, is solid.

In addition, we cannot meet our 2020 needs for electricity solely by maximizing renewable energy and energy efficiency. It is projected that by 2020, under business as usual, New Jersey's homes and businesses will use 97,800 GWh of electricity annually. Achieving Governor Corzine's goal for reducing electricity consumption 20% by 2020 would reduce our electricity demand to approximately 78,300 GWh annually. Achieving the installation of 1500 MW of combined heat and power cogeneration facilities by 2020 will provide 10,000 GWh, leaving 68,300 GWh to be supplied. Obtaining 30% of our electricity supply from renewable sources, as will be required under enhanced Renewable Portfolio Standards, leaves about 47,800 GWh of demand to be satisfied from traditional generation.

This demand must be satisfied from existing in state power plants, through the development of new in state power plants, the development of power plants outside New Jersey, or from a combination of these options. Whichever option or combinations of options are used to meet this electricity demand, they must be consistent with the State's 2020 and 2050 greenhouse gas targets. Our current fleet of power plants cannot be expected to supply all of this electricity, especially when much of the fleet is aging, expected to retire, or likely to be exporting its power.

Meeting our current and future energy demands will depend on an increase in electric generation capacity available to New Jersey. Importing additional conventional coal-based electricity, or developing more high-emitting power plants within New Jersey, will undermine our efforts to fight global warming.

Therefore, the State will pursue the following action items to ensure that New Jersey's energy infrastructure is modern and reliable:

- Work with the electric and gas utilities to develop master plans through 2020 that will be responsive to the goals and action items in this plan. This will include the examination of smart grid technologies and modernizing the electricity grid to 21st century technologies.
- Foster development of 1500 MW of new cogeneration capacity in New Jersey by 2020. Cogeneration development has for the most part stalled over the past decade. Through a series of actions including rebates and sales and use tax exemptions, the State will attempt to stimulate growth in cogeneration plants, which will provide an alternative energy source for commercial and industrial customers.

- Ensure a balance between energy supply and energy demand that is consistent with the State's greenhouse gas targets and provides energy at a reasonable price. This balance includes the support of fuel supply projects, such as liquefied natural gas, as long as the comply with the DEP's environmental standards, and consideration of nuclear energy technology if it is determined that additional baseload supply is needed.

GOAL 5: Invest in innovative clean energy technologies and businesses to stimulate the industry's growth in New Jersey.

The Governor's Economic Growth Strategy committed to aggressively encouraging the expansion and creation of clean energy solutions, and declared the clean energy technology sector as a cornerstone of the Edison Innovation Fund. The State must continue this investment, and expand its efforts to help attract and grow the clean energy technology sector in New Jersey. Therefore, the State will work to implement the following action items:

- Expand efforts that encourage the development of clean energy technologies by expanding the Edison Innovation Fund to invest in innovative clean energy technologies and provide support to business incubators that support clean energy business development.
- Develop timely and industry recognized job training programs to ensure that a New Jersey based workforce will be used to implement the action items articulated in this plan.
- Establish the Energy Institute of New Jersey to support the basic and applied energy research efforts at the colleges and universities in the State.

The Energy Master Plan provides the State with a road map to securing a clean, reliable and affordable energy future. This alternative plan will save consumers $6.4 billion in 2020 and $30 billion between 2010 and 2020. This plan will also result in an investment of approximately $33 billion by 2020 into our energy infrastructure, which will result in the creation of approximately 20,000 jobs by 2015. In addition, based on current projections and assuming that all aspects of this plan are fully implemented, this plan will result in reducing carbon dioxide emissions to 56.1 million metric tons in 2020, compared to 84 million metric tons in the business as usual scenario. This is almost 23% lower than the 72.8 million metric tons emitted in 1990. Together, these efforts will strengthen New Jersey's economy by reducing consumers overall energy expenditures, while creating jobs, improving the current energy infrastructure and meeting our environmental goals. The Plan offers aggressive policies that create an energy system that is responsible and will establish the clean energy industry as a major part of New Jersey's economy.

INTRODUCTION

The critical role of energy in our economy and our environment is nothing new. Over the past several decades, energy challenges have repeatedly awakened us to our growing demand for energy and regional and global competition for supply, and to our resulting vulnerability to high prices, supply shortages, and environmental impacts.

After the oil shocks of the early 1970s, New Jersey enacted a law requiring a regularly updated Energy Master Plan to address the production, distribution, consumption and conservation of energy in New Jersey. The law requires the Plan to include not only long-term objectives, but also interim measures that are consistent with and necessary to achieving those objectives.

Our ultimate objective is to ensure that New Jersey has a reliable supply of energy, at a reasonable price that is produced and consumed in a manner consistent with the State's environmental needs. At first glance, these objectives seem to conflict. When the growth in energy supply does not keep up with growth in demand, prices tend to rise and the supply becomes less reliable. When growing energy demand is met by an increase in the use of fossil fuels, the resulting greenhouse gas emissions threaten to exacerbate the higher temperatures, higher sea levels, and more frequent and more severe floods and droughts that we have experienced in New Jersey. A second look, however, shows that we can make progress toward all of these objectives by using energy more efficiently, by using less of it at times when heavy demand strains our infrastructure, and by producing more clean energy locally.

With those challenges and opportunities in mind, we must plan for meeting these challenges; we must carry out those plans, and we must measure the results we achieve and adjust our tactics in response. For that reason, State law requires the Energy Master Plan to be revised and updated at least once every three years. The State has not done so since 1995. Much has changed since then and much now needs to be done to shape our energy future.

This plan focuses on the challenges in the electricity and heating fuels sectors. The transportation section will be released separately as part of the DEP's Global Warming Action Plan. This will facilitate a responsible and productive public discussion on each of these important energy issues. However, the transportation goals and action items cannot be addressed without understanding its necessary interrelationship with the broader energy policy objectives being pursued by the State. Therefore, all revisions, updates and future Energy Master Plans will include the transportation sector as part of its analysis.

ENERGY BACKGROUND

Electric "deregulation." Up until the 1980s, electric generation was largely built, owned and operated by the electric utilities. Since then, the generation industry has grown more competitive as the federal and state governments reduced their regulation on the industry. In 1995, when the previous Energy Master Plan was updated, electric utilities generated most of the electricity in the State, under the regulation and oversight of the Board of Public Utilities (BPU). The utilities built, maintained, and operated power plants, with the expectation that the BPU would allow them to recover their prudently incurred costs from electricity customers, plus an opportunity to earn a specified rate of return. In this arrangement, the utilities were insulated against the risk of loss that State-approved investments in electric generation might prove unwise; electricity customers bore that risk. In exchange, the utilities bore an obligation and a responsibility to generate, transmit, and deliver electricity to serve those customers.

Substantial power industry restructuring occurred in 1999, when former Governor Christine Todd Whitman signed the Electric Discount and Energy Competition Act (EDECA). Under EDECA, utilities were no longer responsible for generating electricity. Instead, EDECA deemed electric generation to be a "competitive service," not subject to State energy regulation.

These fundamental changes in the structure of the electric generation industry have therefore shifted and diffused much of the authority to make decisions about the reliability of our electricity supply and the price we pay for it. Much of that authority now rests with:

- *Power plant owners*. The owners of New Jersey power plants now have no legal expectation that they can recover all of their costs or a guaranteed return from retail customers. Hence, the plant owners (and their financiers) make their own decisions to invest in existing or new power plants, without BPU oversight. They also make their own decisions about the price, using market signals, at which they are willing to sell their electricity, without traditional BPU oversight.
- *PJM*. PJM Interconnection LLC ("PJM"), the regional transmission organization, plans and operates the electric transmission grid in a region that covers thirteen states and the District of Columbia, stretching from New Jersey as far west as Illinois and as far south as North Carolina. PJM also designs and administers wholesale electricity markets in that region.
- *FERC*. The Federal Energy Regulatory Commission ("FERC") regulates PJM. PJM must obtain the FERC's approval of a variety of decisions, such as changes to the wholesale electricity markets, and determinations of how much electricity customers pay for upgrades to the transmission system. The FERC also has the authority to override state decisions on the siting of transmission lines, or to take over the siting process if the state takes too long to complete it.
- *Electric Utilities*: The following four electric utilities in the State operate the electric distribution systems that deliver electricity to end users, and procure energy, capacity, and all other electricity requirements from the wholesale market to serve virtually all but the largest industrial and commercial electricity customers:
    1. Atlantic Electric (AE)
    2. Jersey Central Power and Light (JCP&L)

3. Public Service Electric and Gas Company (PSE&G)
4. Rockland Electric Company.

- *BPU*. The New Jersey Board of Public Utilities ("BPU") regulates electric utilities, in all of the functions described above. The BPU has no direct authority over the wholesale electricity markets or the electric transmission operated by PJM, but can advocate for New Jersey's interests before PJM and the FERC. The BPU oversees the Basic Generation Service (BGS) auction through which the utilities obtain contracts for supplies to serve customers who do not shop for their own power supplies. The BPU also administers the Clean Energy Program, which supports the development of renewable energy and the enhancement of energy efficiency through regulatory programs and financial assistance.
- *DEP*. The New Jersey Department of Environmental Protection ("DEP") issues permits for air pollution control, water pollution control, land use, and the management of other environmental impacts. Power plants need some or all of these permits to be constructed, improved, or operated. The DEP also develops and implements programs that cap overall emissions of air pollutants, such as carbon dioxide and oxides of nitrogen, from power plants and other large facilities.

Energy and capacity. In the electricity sector, planning for the supply and use of electricity involves an understanding of two products, known as “energy” and “capacity.” Electric “energy” refers to the electricity that power plants actually generate and that end users actually use. “Capacity” refers to the maximum output ability of power plants to generate electricity. With few exceptions, electricity must be generated at the same time as it is being consumed. This means that sufficient capacity to generate and deliver electricity must be built and operated to meet consumers’ highest projected demand, plus a reserve.

Electric “energy” is measured in watt-hours, kilowatt-hours, megawatt-hours, or gigawatt-hours.

- It takes 60 watt-hours of electricity to power a 60-watt light bulb for one hour.
- A kilowatt-hour is 1,000 watt-hours. The average New Jersey home uses about 9,000 kilowatt-hours (kWh) of energy each year.
- A megawatt-hour is 1,000 kilowatt-hours. Wholesale electricity prices are generally expressed in dollars per megawatt-hour (MWh).
- A gigawatt-hour is 1,000 megawatt-hours. New Jersey’s four nuclear power plants generated about 32,000 gigawatt-hours (GWh) of energy in 2007. Total retail energy sales in New Jersey totaled about 81,000 GWh in 2007.

Currently, electricity cannot be feasibly stored in large quantities. Therefore, it must be generated and consumed almost simultaneously.

“Capacity” is typically measured in megawatts (MW).

- A power plant with 600 MW of capacity can generate 600 MWh in one hour.

- New Jersey is home to about 17,000 MW of generation capacity currently in operation.[1]
- PJM projected summer 2008 peak demand to be 2,829 MW for Atlantic City Electric; 6,478 MW for Jersey Central Power & Light; 10,967 MW for Public Service Electric & Gas; and 435 MW for Rockland Electric Co, for a total projected peak demand of 20,709 MW.[2]

Capacity, peak demand, and infrastructure. New Jersey needs sufficient capacity to meet daily energy requirements and projected peak demand on the highest usage hour of each year, plus a reserve, which helps to ensure the reliability of the system. That capacity includes electric generation infrastructure, and transmission and distribution infrastructure to move the electricity from power plants to customers. The higher the peak demand rises, the more infrastructure is needed to provide the capacity to satisfy that peak, and the greater the cost to New Jersey electricity customers. Conversely, measures to reduce electricity consumption at times of peak demand, known as "demand response," can reduce the peak, reduce the infrastructure needed, and therefore reduce the cost to New Jersey electricity customers.

Heating Fuels. Oil and natural gas make up a critical component of New Jersey's fuel mix that is not only used for generating electricity, but also heating. Both of these fuels have experienced significant increases and tremendous volatility in their prices over the past several years. Since 2002, the cost of heating oil and natural gas for residential customers in the northeast has increased more than 200%.

Natural gas supply is provided by the State's gas utilities, which include:

1. PSE&G
2. New Jersey Natural Gas
3. South Jersey Gas
4. Elizabethtown Gas

This fuel source is largely supplied through a pipeline system that stretches down to the Gulf of Mexico.

Heating oil relies on a system of barges, tankers, trucks, rail and pipelines to distribute this fuel supply to customers. This fuel supply is delivered by numerous home heating oil companies that are located throughout the State.

Rising oil and natural gas prices. The commodity markets are demonstrating that growth in the supply of energy is not keeping up with the growth in demand. The dependence for much of this supply from regions of the world that are experiencing tremendous turbulence and conflict with the United States, increases the risk of supply interruptions and consequently the price volatility of these fuel sources. From January 2007 through July 2008, crude oil prices more than tripled, from just over $45 per barrel to more than $140 per barrel before falling back to around $110 per barrel in August

[1] Energy Information Administration, New Jersey Electricity Profile, November 2007, Table 1, http://www.eia.doe.gov/cneaf/electricity/st_profiles/new_jersey.html.
[2] PJM Load Forecast Report, January 2008.

2008– an increase and volatility that can be blamed only in part on the declining value of the dollar.[3] In addition, the cost of heating oil also nearly tripled since 2002 from $1.16/gallon in January 2002 to $3.39/gallon in January 2008.[4]

Natural gas, of which more than 80% of the total United States demand is supplied domestically, has also experienced a dramatic increase in prices. After decades of relative stability, natural gas prices more than doubled and in some cases tripled between 2002 and 2008, with prices nearing post-Katrina peaks in May and June of 2008.[5]

Since many New Jersey residents use natural gas and oil for heating, increases in the price of those commodities will increase the cost of heating, even if the amount of the fuel used were to remain unchanged. Rising natural gas prices also increases the price of electricity, much of which is generated from the combustion of natural gas.

GLOBAL WARMING

Satisfying the world's appetite for energy contributes to the growing crisis of global climate change, and New Jersey's energy environment is contributing to this crisis. Although New Jersey's contribution is small when measured against the rest of the world, we can help lead the way in reducing the threat of climate change, and position ourselves to be as economically competitive as possible as the world mobilizes to address that threat.

Most power plants generate electricity by burning fossil fuels, such as coal, oil, or natural gas. The combustion process releases air pollutants including nitrogen oxides, sulfur dioxide, mercury, and fine particles – pollutants that cause acid rain, respiratory diseases, neurological damage, and premature death. To attain health standards for ozone and fine particles, the DEP has developed plans which affect electric generating units, as well as most other major air pollution source categories. The DEP's Ozone State Implementation Plan, which was submitted to the EPA earlier this year, commits to a multi-pollutant control program for New Jersey's existing seven coal fired power plants. That will require all units to install up to date air pollution control systems for nitrogen oxides, sulfur dioxide, and other particulates.

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[3] Energy Information Administration, U.S. Spot Price FOB Weighted by Estimated Import Volume, http://tonto.eia.doe.gov/dnav/pet/hist/wtotusaw.htm; Bloomberg, "Oil Rises to Record for Fifth Day in New York on Weak Dollar," March 11, 2008, accessed March 11, 2008 at http://www.bloomberg.com/apps/news?pid=20601081&sid=aLom4V1suPNI&refer=australia..

[4] See Energy Information Administration, Weekly U.S. No. 2 Heating Oil Residential Prices, http://tonto.eia.doe.gov/dnav/pet/hist/whoreus4w.htm.

[5] See Energy Information Administration, U.S. Natural Gas Prices, http://tonto.eia.doe.gov/dnav/ng/ng_pri_sum_dcu_nus_m.htm. Wintertime "City Gate" prices, determined at a point or measuring station at which a gas utility receives gas from a natural gas pipeline company or transmission system, generally remained under $4 per thousand cubic feet each January from 1984 through 2000, but ranged from $5.20 to $8 each January since 2004. Summertime prices stayed under $4.00 each August from 1984 through 1999, but ranged from about $6.50 to $8.20 each August from 2004 through 2007.

For oil and gas fired electricity generating units, which are mostly peaking units used on high energy demand days (HEDD), the new HEDD rules will require lower nitrogen oxides emissions in two phases. The second phase in 2015 is anticipated to result in electricity generators replacing many of their old peaking units with new lower emitting and higher efficiency units, which will reduce the amount of harmful ozone in our air. These performance standards for coal, oil, and gas fired generators complement and move beyond federal emission trading rules for nitrogen oxides and sulfur dioxide.

Burning fossil fuels also releases carbon dioxide, a greenhouse gas that is contributing to the accelerating warming of our planet and changing our climate. Fossil-fueled electric generation, and the extraction and transport of the fossil fuels it depends on, also cause the emission of other greenhouse gases such as methane and nitrous oxide. Although these gases are emitted in far smaller quantities than carbon dioxide, each ton of those gases contributes more to global warming than a ton of carbon dioxide.

Existing power plants can be fitted with air pollution controls that will dramatically reduce emissions of all of these pollutants except for carbon dioxide. At the present time, no such control technology is available for carbon dioxide. Significantly reducing carbon dioxide emissions from existing power plants therefore depends on a transition away from the most carbon-intensive power plant technologies, and toward technologies that generate electricity with less carbon dioxide emissions or none at all.

As part of its response to Executive Order 54 and the Global Warming Response Act, the DEP has prepared the table below (Table 1) that shows the greenhouse gas emissions by each sector, including the emissions from electricity generation. The emissions from electricity generation, from both in-state generation and emissions estimates of imported electricity, was approximately 33.4 million metric tons in 2005, which is approximately 25% of New Jersey's total greenhouse gas emissions. If no actions are taken, New Jersey's electricity contributions to greenhouse gas emissions may grow more than 27.5% from 2005 to 2020.

In addition to the Energy Master Plan process, several other initiatives are currently underway that will shape New Jersey's energy future. These initiatives include the Regional Greenhouse Gas Initiative (RGGI), Governor Corzine's Executive Order 54, and the Global Warming Response Act.

RGGI caps carbon dioxide emissions from power plants in ten Northeast and Mid-Atlantic states. RGGI requires electric generation facilities to purchase and use an emissions credit, called an "allowance," for each ton of carbon dioxide they emit. All of the money New Jersey collects when it sells these allowances will be invested in energy efficiency, renewable energy, cogeneration, and environmental enhancements that will reduce New Jersey's total carbon footprint.

The Governor's Executive Order Number 54 calls for the reduction of greenhouse gas emissions to 1990 levels by 2020, approximately 25% below "business as usual,"

followed by a reduction of emissions to 80% below 2006 levels by 2050. The DEP has been charged with developing a report to outline the State's strategies to achieve these targets, and will be issuing a report to satisfy the combined requirements of the Executive Order and the Global Warming Response Act in the fall of 2008.

The Global Warming Response Act, signed into law in July 2007, builds upon the aggressive emission reduction targets of the Executive Order, and mandates that these reduction targets be achieved. In addition, the first update of the Energy Master Plan following the enactment of the Global Warming Response Act includes recommended policies and measures that will contribute to achieving the 2020 limit on greenhouse gas emissions, by reducing the emission of greenhouse gases from the production, processing, distribution, transmission, storage, or use of energy.

(Million Metric Tons CO_2e)	1990	2000	2005	2010	2020	Explanatory Notes for Projections
Energy	**111.9**	**118.4**	**130.4**	**131.2**	**145.1**	
Electricity, Production-Based	12.4	20.2	20.3	17.9	31.7	All electricity values based on NJBPU projections, see assumptions in Appendix A.
Coal	6.9	10.7	9.6	12.4	15.6	
Natural Gas	3.6	7.4	8.3	4.1	13.4	
Oil	1.7	0.9	1.1	0	0	
Wood (CH_4 and N_2O)	0.01	0.03	0	0	0	
Refuse and biomass	0.2	1.3	1.3	1.4	2.7	Under review; subject to revision
Net Imported Electricity	14.1	7.3	13.1	18.8	10.9	
Electricity Consumption Based	**26.5**	**27.5**	**33.4**	**36.7**	**42.6**	
Residential/Commercial/Industrial (RCI)	**46.3**	**43.4**	**45.1**	**39.4**	**41.4**	
Coal	0.70	0.033	0.029	0.029	0.030	Based on USDOE data
Natural Gas	20.5	25.6	26.2	22.9	26	Based on NJBPU projections
Oil	25	17.7	18.8	16.4	15.3	Based on NJBPU projections and USDOE data
Wood (CH_4 and N_2O)	0.14	0.09	0.08	0.08	0.08	Based on USDOE data
Transportation	**36.6**	**45.2**	**49.5**	**52.7**	**58.6**	
On-road Gasoline	29.8	35.6	38.9	41.1	44.3	Based on USDOE regional projections
On-road Diesel	4.22	6.76	7.63	8.54	11.0	Based on USDOE regional projections
Marine Vessels	1.01	1.35	1.48	1.56	1.79	
Rail, Natural Gas, LPG, other	0.63	0.48	0.48	0.51	0.55	Based on USDOE regional projections
Jet Fuel and Aviation Gasoline	1.00	1.00	1.00	1.00	1.00	Estimated in-state portion of emissions only
Fossil Fuel Industry	**2.5**	**2.2**	**2.4**	**2.5**	**2.6**	
Natural Gas Industry	2. 45	2.23	2.40	2.45	2.55	
Industrial Processes	**1.3**	**2.9**	**4.0**	**5.5**	**8.6**	
Nitric Acid Production (N_2O)	0.203	0.001	0.001	0.001	0.001	Based on State's modeling forecast of manufacturing employment for 2006-2020
Limestone and Dolomite Use (CO_2)	0.000	0.003	0.005	0.005	0.004	Based on State's modeling forecast of manufacturing employment for 2006-2020
Soda Ash (CO_2)	0.08	0.08	0.08	0.08	0.08	Based on 2004 and 2009 projections for U.S. production

ODS Substitutes (HFC, PFC)	0.010	2.41	3.59	5.16	8.37	EPA 2004 ODS cost study report
Electric Power T & D (SF_6)	0.63	0.4	0.4	0.21	0.12	Based on national projections (USEPA)
Semiconductor Manufacturing (HFC, PFC, SF_6)	0.01	0.03	0.03	0.02	0.01	Based on national projections (USEPA)
Laboratory Use of SF_6	0.33	0.02	0.02	0.02	0.02	Assumed no change from 2005 levels.
Waste Management	**15.9**	**7.8**	**5.9**	**5.1**	**4.6**	
Waste Combustion	0	0	0	0	0	Captured under electricity production sector
Landfills	15.4	7.3	5.4	4.5	4.0	Includes waste land filled out of state
Wastewater Management	0.45	0.52	0.54	0.57	0.64	Projections based on historical 1990 to 2005 average annual growth rate.
Agriculture	**0.6**	**0.6**	**0.5**	**0.5**	**0.4**	
Enteric Fermentation	0.13	0.09	0.08	0.07	0.06	
Manure Management	0.04	0.03	0.03	0.03	0.02	
Agricultural Soils	0.45	0.43	0.39	0.39	0.35	
Forestry and Land Use (Land Clearing Releases)	**1.1**	**1.1**	**1.1**	**1.1**	**1.1**	Based on NJDEP methodology; See Appendix H
Total Gross Emissions	**130.8**	**130.8**	**142.1**	**143.4**	**159.9**	
Forestry and Land Use (Sequestration)	**-7.5**	**-7.0**	**-6.7**	**-6.5**	**-5.9**	Based on NJDEP methodology; See Appendix H
Net Emissions (incl. forestry*)	**123.2**	**123.8**	**135.3**	**136.9**	**154.0**	
Increase in net emissions relative to 1990		**<1%**	**10%**	**11%**	**25%**	

Table 1: New Jersey Historical and Reference Case GHG Emissions, by Sector.[6]

This Energy Master Plan recommends a series of policies and measures to reduce greenhouse gas emissions associated with electricity and heating fuels. The DEP's Executive Order 54 report and Global Warming Action Plan will be responsible for reducing greenhouse gas emissions across all sectors, including but not limited to the electricity, heating fuels and transportation sectors.

ROLE OF THE ENERGY MASTER PLAN

The Energy Master Plan must incorporate, as its fundamental priority, the assurance that New Jersey electricity and heating fuel customers will receive a reliable supply of electricity and heating fuels at a reasonable price, consistent with the State's environmental priorities. The planning effort must also recognize that the State cannot simply dictate this result, because fuel suppliers, power plant owners, PJM, the FERC, and other countries all may make decisions that can help or hinder our efforts.

For example, the price of electricity for New Jersey customers depends, more than anything else, on the structure of the wholesale markets as determined by PJM and the

[6] *The Draft New Jersey Greenhouse Gas Inventory and Reference Case Projections 1990-2020.* http://www.nj.gov/globalwarming/ NOTE: Totals may not equal exact sum of subtotals shown in this table due to independent rounding.

FERC, and the price at which power plant owners sell their power into these markets. That price, in turn, depends heavily upon decisions made by PJM and the FERC regarding upgrades to the regional transmission grid, and even more heavily upon the prices that national and international commodities markets establish for natural gas and other fuels used to generate electricity.

Similarly, the cost and reliability of New Jersey's supply of electricity depends heavily on decisions made by power plant developers to site plants in strategic locations, and on decisions made by PJM about upgrades to the transmission grid. Those same decisions shape the carbon footprint of our electricity supply.

For these reasons, this Energy Master Plan has been crafted with full recognition of what the State can do directly to affect the reliability and cost of energy; what the State is constrained to do indirectly to influence the decisions of PJM, the FERC, and power plant owners and developers; and what factors are outside the State's control. The Plan analyzes New Jersey's current energy challenges and projected future challenges, while proposing a series of actions to shape an energy future that addresses our economic and environmental needs - some that are already underway, some that are clearly constructive and necessary, and some that reflect hard choices deserving of thoughtful and thorough public debate.

"Business as Usual". Under a "business as usual" approach with no changes in State policies or actions, New Jersey's projected energy demand in 2020 will be about 97,800 GWh of electricity and over 542 trillion BTUs of natural gas, heating oil and propane at a total annual cost to New Jersey consumers of $30.7 billion. The average household will spend over $1,700 on electricity, and over $1,800 on heating fuels (including natural gas, heating oil and propane). In addition, greenhouse gas emissions from the electricity and heating fuel sectors will increase to over 84 million metric tons of carbon dioxide.

However, the Energy Master Plan proposes an alternative scenario that includes a series of goals and action items that will effectively reduce energy consumption by 20 percent, to approximately 78,300 GWh of electricity, and 434 trillion BTUs of heating fuels. Less demand means a lower total cost to New Jersey electricity consumers. Less demand will also mean less energy generation from the combustion of fossil fuels, resulting in fewer emissions of carbon dioxide and other pollutants. In total, this reduced demand will amount to more than $30 billion in energy savings between 2010 and 2020.

This plan also proposes action items that will position New Jersey to exceed many of its current goals, such as the requirement to have 20% of 2020 New Jersey electricity consumption supplied from Class I renewable sources, including solar technologies, photovoltaic technologies, wind energy, fuel cells, 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. The Plan also encourages the development of other distributive generation such as cogeneration and sets aggressive targets to reduce the peak demand for electricity by 5,700 MW.

Together, the action items in this plan will require more than $33 billion in capital investment between now and 2020, which will significantly grow the State's clean energy economy. This clean energy economy will provide increased job opportunities for New Jersey's workforce, which will be coupled with job training programs that ensure a locally trained workforce to do the work necessary to implement this plan. The economic growth impacts and reduction in total energy expenditures in the State will help strengthen the economy and put New Jersey at the forefront of a clean energy 21st century economy

Stakeholder process. Beginning in October 2006, the State conducted a comprehensive stakeholder process to understand the current energy landscape, the diverse challenges facing the State and the possible solutions to meet these challenges. Together, the BPU, the DEP, the Department of Transportation (DOT), the Office of Economic Growth (OEG) and the Governor's Office have engaged more than 500 stakeholders, from the public and private sectors, in an effort to develop the strategic energy initiatives that are outlined in this plan.

The State's plan to address the challenges in the transportation sector will be released as part of the DEP's Executive Order 54 report and Global Warming Action Plan, to facilitate a responsible and productive public discussion on each of these important issues.

The Center for Energy, Economic and Environmental Policy (CEEEP) and the Rutgers Economic Advisory Service of the Center for Urban Policy Research (R/ECON™) at Rutgers University assisted the state in conducting extensive analysis to help understand and address New Jersey's current and future energy requirements. The CEEEP and R/ECON™ completed modeling that provided a framework to study the potential costs of continuing business as usual versus the costs of implementing a series of different strategies to meet the State's energy challenges. This analysis focused on how different energy strategies could affect energy use, economic growth, air quality, energy prices and greenhouse gas emissions. The inputs and results of the CEEEP and R/ECON™ modeling can be found at the Energy Master Plan website at www.nj.gov/emp.

Also, several workgroups were established to assist in the drafting of the Energy Master Plan. Their advice and expertise of the diverse stakeholders who participated in these groups were invaluable and these stakeholders will continue to be engaged in a dialogue after the release of the Plan.

After the draft Plan was released in April 2008, there were more than 15 public meetings over a 100 day period that provided valuable comments and recommendations on the Plan. The changes in this Energy Master Plan from the initial draft are the result of the comments that were received and additional analysis done by staff and Rutgers CEEEP.

In addition to this document and the modeling report, the Energy Master Plan includes the Energy Master Plan Implementation Strategies. This document, which can be found

at the Energy Master Plan website at www.nj.gov/emp, contains detailed information to the extent known on each strategy, including a brief description, the anticipated energy savings or energy production, a detailed program design, costs and savings to ratepayers, affected sectors, administrative costs, the entity responsible for moving the strategy forward, the timeline for action, the source of funding for the strategy and the performance metrics that will be used to determine if the strategy is producing the desired results.

There will be an annual review of the progress being made on the Energy Master Plan strategies by the State Energy Council that is described in greater length later in this document. Where there are divergences from the Plan, the review will explain why the goal or action item was not completed and what changes to policy are necessary to be consistent with the Plan.

The Plan will be updated every three years, with emphasis on addressing new issues that develop during the planning interval and extending the time period to an additional point in the future. For instance, the first update of this Plan should occur in 2011 and address the energy picture out to 2025. This plan will also incorporate the transportation goals and action items that for this Plan are being addressed in the Global Warming Action Plan. The transportation sector has a significant impact on New Jersey's energy picture, and while it is not incorporated in this report, it will be incorporated in all major energy policy activities by the State.

The Energy Master Plan outlines a path toward a future with a reliable, competitively priced supply of energy that is produced and used in a way that meets the State's environmental needs. It offers a valuable opportunity for New Jersey to determine the necessary actions to meet the energy challenges that are facing the region and the country. The challenge of global warming tells us that we cannot continue to produce and use energy the same way we did throughout much of the twentieth century and continue to do today. The future belongs to those who produce and use energy as wisely as possible, and to those who develop the technologies that make this possible. This plan gives New Jersey businesses and citizens an opportunity to invest in our energy future. If we in New Jersey can put ourselves at the forefront of those efforts, we will be positioned to advance our economy as we protect our environment.

ELECTRICITY & HEATING FUELS – THE CHALLENGES

In August 2003 a blackout hit an area with a population of about 50 million, including northern New Jersey and much of the Midwest and Northeast, as well as parts of Canada. A joint U.S.-Canadian task force investigating the blackout summarized the importance of electricity to modern life:

> Modern society has come to depend on reliable electricity as an essential resource for national security; health and welfare; communications; finance; transportation; food and water supply; heating, cooling, and lighting; computers and electronics; commercial enterprise; and even entertainment and leisure—in short, nearly all aspects of modern life.[7]

We depend as well on heating fuels (natural gas, heating oil and propane) to keep our homes, schools, and businesses warm in the winter. This is not only a matter of comfort; in severe conditions, it can be a matter of life and death. These fuels are also used to produce hot water and steam, for cooking and in industrial applications.

To address the challenges we face with electricity and with heating fuels, we must first identify what those challenges are.

With respect to electricity:

- The reliability of our supply of electricity is at risk.
- The price of electricity is high, and rising.
- The generation of electricity is contributing to global climate change.
- Unless New Jersey takes action to solve these problems ourselves, other decision-makers will choose and implement costly actions that will not position us well to ensure either reliability or more reasonable prices, and that will increase our contribution to global warming.

With respect to heating fuels:

- The prices of natural gas and heating oil are high, and rising.
- The use of heating fuels is contributing to global climate change.
- New Jersey has little ability to influence these prices, which are largely set on national and international commodities markets.

Understanding the root causes of these challenges leads to a clear outline of the types of actions needed:

- Reduce peak demand for electricity;
- Reduce overall consumption of electricity and heating fuels; and
- Increase the amount of clean electric generation available locally.

[7] U.S.-Canada Power System Outage Task Force, "Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations," August 2004, p. 5.

ELECTRIC RELIABILITY

Although serious blackouts, brownouts, and other disruptions of the electricity supply may be infrequent, they can cause extraordinary harm. Total costs of the August 2003 blackout to the United States were estimated to range from $4 billion to $10 billion.[8] Similarly, power outages along the New Jersey shore over the 2003 July 4 weekend seriously harmed businesses that depend heavily on that weekend as part of their success each year.

A reliable supply of electricity depends on several factors. Power plants must have enough capacity to generate enough electricity to satisfy customers' peak demands. The transmission system must have enough capacity to handle the electricity that the power plants generate, and deliver it to the areas where demand is concentrated. The distribution system must take power from the transmission system and reliably deliver it to the customers who need it.

Responsibility for ensuring reliability rests in several hands. PJM, under the supervision of the FERC, is responsible for planning the electric transmission system to preserve the reliability of the electricity supply in its territory. Electric generation companies and their financiers make decisions about how much generating capacity will be built, what types of power plants will provide that new capacity, and where the new plants will be located; those companies also decide what plants will be kept in service and what plants will be retired. Those decisions are informed by economic signals from the wholesale electricity markets that PJM designs and administers, again under the supervision of the FERC. New Jersey's local electric utilities, under the supervision of the BPU, are responsible for preserving the reliability of their distribution systems.

PJM has identified a number of factors that are progressively reducing the reliability of the electric transmission system not only in New Jersey, but in southeastern Pennsylvania and the DelMarVa peninsula as well.[9] Those factors include:

- Growth in demand for electricity
- Sluggish development of new power plants
- Deactivations and retirements of local power plants
- Increasing exports of power to New York City and Long Island
- Reliance on transmission to import power into the region from Pennsylvania, West Virginia, and the Midwest.

Growth in demand. New technologies and a higher standard of living have produced changes in the way New Jerseyans consume electricity. As residents build

[8] U.S.-Canada Power System Outage Task Force, "Final Report on the August 14, 2003 Blackout in the United States and Canada: Causes and Recommendations," August 2004, p. 1.
[9] PJM, 2007 Regional Transmission Expansion Plan, February 2008, p. 221.

larger homes, plug in computers, and install flat screen TVs, overall electricity demand increases. As a result the following increases in New Jersey's electricity consumption have been observed:

- From 1980 to 1990, electricity consumption increased by less than 1 percent, to almost 63,000 GWh.
- From 1990 to 2000, electricity consumption increased by 11 percent, to approximately 70,000 GWh.
- From 2000 to 2004, electricity consumption jumped 11 percent to just over 77,500 GWh.

The increase in demand is expected to continue at a rate of 1.38% per year through 2020. Figure 1 shows the projected electricity demand from 2007 through 2020.

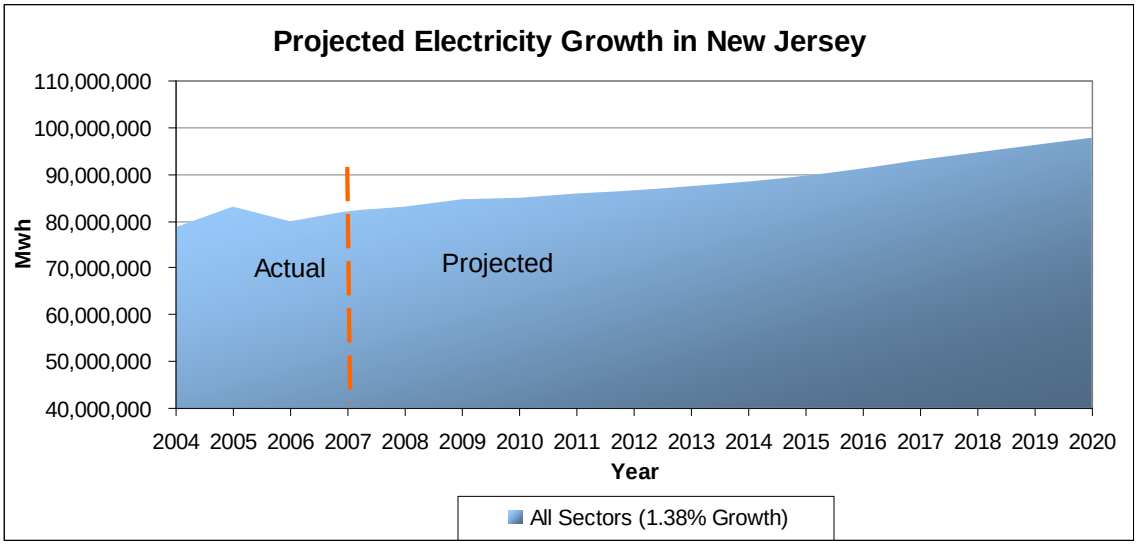

Figure 1: Projected Growth in Electricity Consumption. *If New Jersey does not act to change its energy use, demand is conservatively expected to grow 1.38% per year, leading to an increase in use of 15,800 GWh between 2007 and 2020.*

Peak demand is also steadily increasing. Peak demand typically occurs during the hottest summer days, when air conditioners throughout the state are running to provide relief from the heat and humidity. For example, Figure 2 shows the electricity demand curve for a two month period during the summer of 2006. This figure shows the hourly fluctuations in electricity consumption for each week, and also the weekly fluctuations in consumption due to temperature variations. This is an example of what a typical demand curve looks like, and highlights this peak demand.

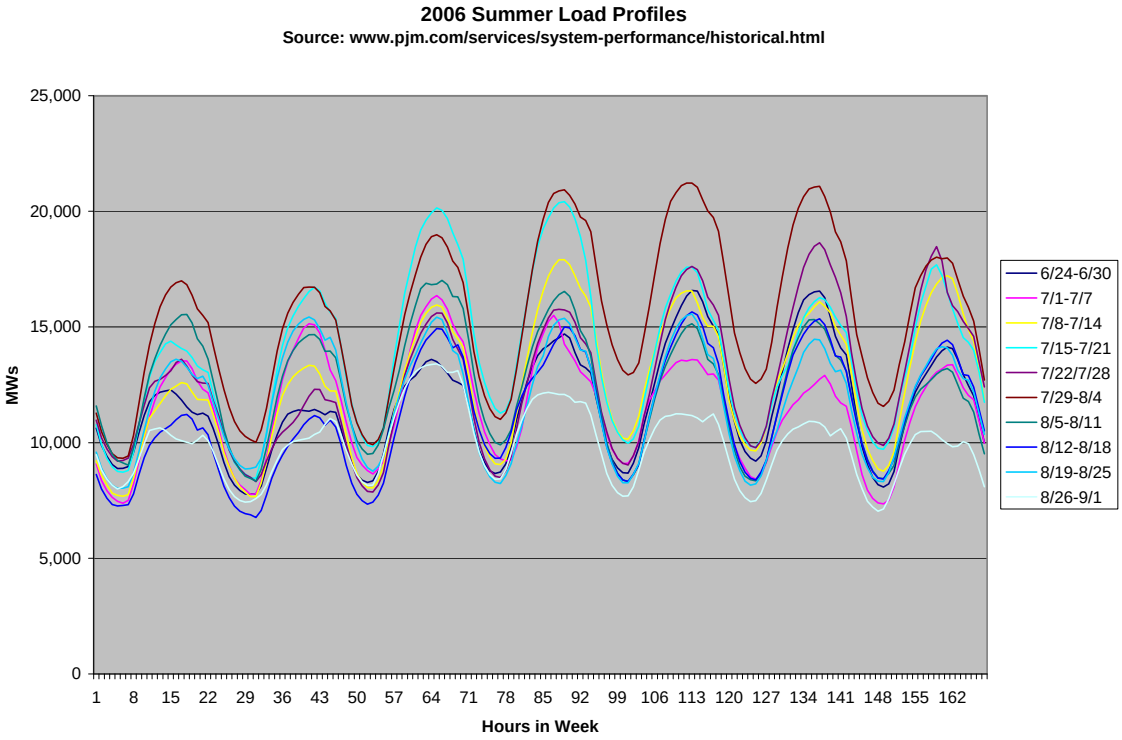

Figure 2: 2006 Summer Load Profiles*. A typical summer load profile has tremendous peak demand times that require sufficient electricity capacity to meet this demand.*

Planning of the electric system depends first and foremost on projections of what the highest peak demand will be each year. The electric system's reliability depends on having enough capacity, including a reserve margin, to generate electricity, to transmit it long distances, and to distribute it to customers at the time of the highest peak demand.

Long-term planning of the electricity system typically is based on projections of the increase in highest peak demand year by year. Plans are made and implemented to expand the system's capacity to transmit and distribute electricity to keep up with the expected increases in the highest peak demand.

PJM forecasted the maximum peak electricity demand in New Jersey to be 20,709 megawatts for the summer of 2008. PJM also projects that peak demand will grow at a statewide rate of 1.75% each year from 2008 to 2018.[10] If peak demand continues to grow at this rate through 2020, New Jersey peak demand in 2020 will be 25,557 MW.

The following table lists those peak demands for each electric utility's territory:[11]

[10] PJM, Load Forecast Report, January 2008, p. 35.
[11] PJM, Load Forecast Report, January 2008, p. 35.

Utility	*Summer 2008 Peak Demand Forecast (MW)*	*Projected Annual Growth Rate*	*Projected 2020 Peak Demand (MW)*
Atlantic City Electric	2,829	2.60%	3,866
Jersey Central Power & Light	6,478	2.00%	8,216
Public Service Electric & Gas	10,967	1.40%	12,978
Rockland Electric	435	1.10%	497
TOTAL	**20,709**	**1.75%**	**25,557**

Table 2: Peak Electricity Demand Forecasts, by Utility

Two general approaches are available to preserve reliability in the face of this growth in peak demand: increasing the system's capacity to generate, transmit, and distribute electricity to keep up with demand; and reducing peak demand.

Both types of approaches can be used simultaneously. However, reducing peak demand is dramatically more cost-effective and therefore must be emphasized. Demand rises to peak levels for only a small number of hours each year – generally fewer than 50 hours out of 8,760. Figure 3 shows the number of hours during 2006 when demand was above a specified level. For example, although the highest demand during the year was more than 21,000 MW, demand rose above 15,000 MW for only a few hundred hours, and was below 10,000 MW the majority of the time.

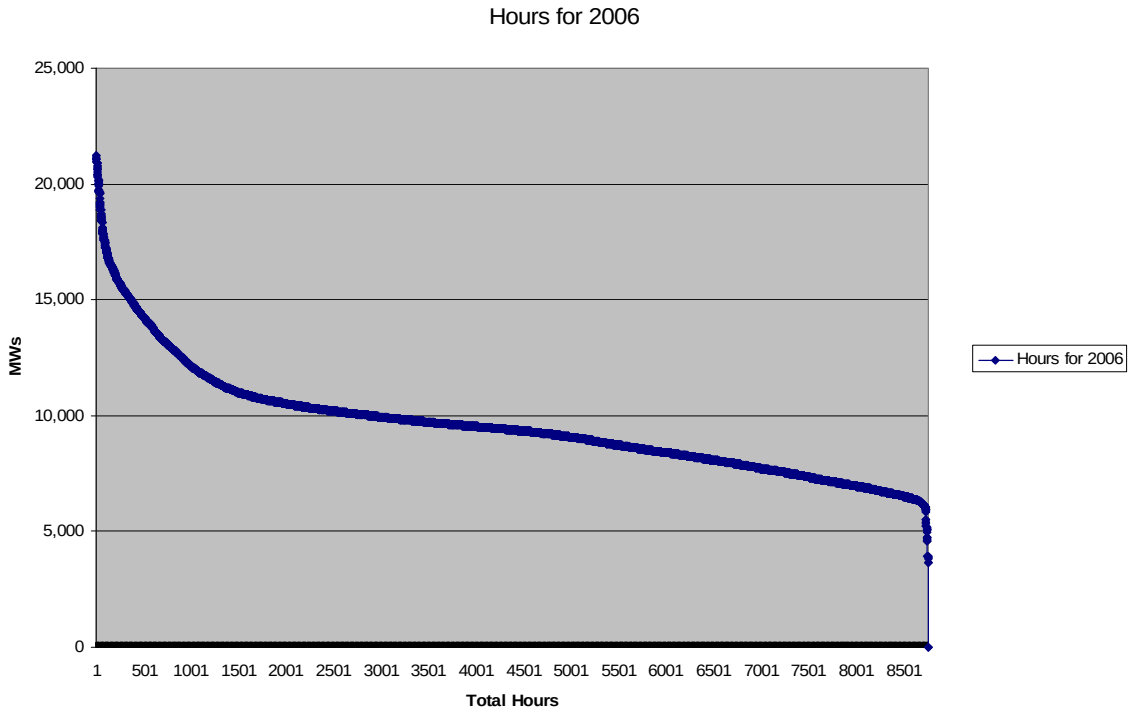

Figure 3: 2006 Load Duration Curve

The demand for this capacity triggers the activation of very high cost generation facilities, called "peaking plants." Calling on these higher-cost plants during peak hours sets a higher price received by all plants providing energy during those hours. The expectation of much higher prices during those peak hours is reflected in a somewhat higher cost for each kWh sold to most customers during both peak and off-peak hours. Figure 4 shows the number of hours in 2007 that wholesale electricity prices were at or above a given level. During those few hours when demand is the highest, wholesale electricity prices increased nearly 300%; in other years, those prices have increased by 1,000% during the highest peak hours.

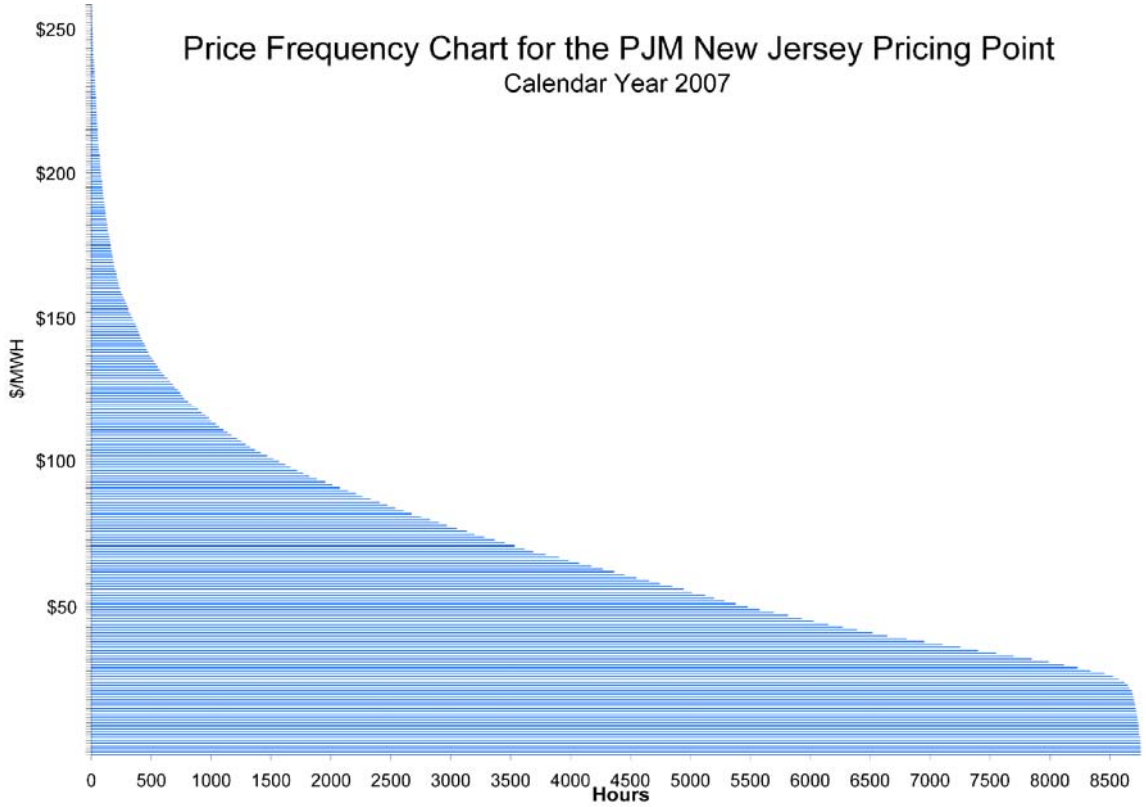

Figure 4: 2007 Price Frequency Chart for the PJM New Jersey Pricing Point.

Building power plants and transmission lines to serve growing peak demand is far more costly than reducing demand during those few hours. Reducing demand at peak times has also demonstrated the ability to generate enormous savings. On August 2, 2006, PJM set a new record of 144,644 MW across its entire territory. In response to this demand, PJM demand response measures were implemented across the region. These peak demand measures resulted in reductions that day reduced wholesale prices by about $300 per MWh, resulting in total cost savings of about $230 million on that single day. Over

the weeklong heat wave that included the record peak, reductions in electricity use yielded savings of about $650 million for the week.[12]

Sluggish development of new power plants. Focusing on reducing peak demand is especially important, because of the difficulty in expanding the capacity of our electricity infrastructure – especially the capacity to generate electricity. As noted above, PJM projects that New Jersey's peak demand will grow by 1.75% annually through 2018, about 2-1/2 times as fast as supply has grown in recent years. Meanwhile, electric generation capacity in New Jersey grew at an average annual rate of 0.71% between 2002 and 2008.

A variety of explanations have been offered for the slow growth in electric generation capacity in general and baseload capacity in particular. A few examples follow:

- Reluctance of the financial community to finance new plants, due to uncertainties about future regulation of power plant emissions of carbon dioxide and other pollutants, uncertainties about volatile fuel prices, uncertainties about construction costs at a time when those costs are rising rapidly, and uncertainties about longer-term energy and capacity revenues;
- High barriers to entry for new plants, such as high capital costs, high real estate prices, and local opposition to new power plants on sites that were not previously used for electric generation;
- Inadequate revenues from the capacity market. Until PJM began implementing the Reliability Pricing Model (RPM), prices for capacity were approaching zero. The very low capacity prices left new plants to rely almost entirely on energy revenues for their earnings. Since peaking plants run for only a small number of hours each year, their energy revenues are necessarily limited, and were likely to be insufficient to support financing. With RPM, PJM sought to encourage the development of new plants by increasing capacity prices dramatically, having the prices reflect local conditions, and making the prices more stable. While PJM has indicated that the RPM has brought new capacity into the region, it remains to be seen whether RPM will fully succeed in bringing new plants into service; what is already certain is that only a small fraction of the much higher capacity revenues are flowing to new plants, while existing plants still receive the vast majority of these payments.

Since deregulation of the electric generation industry in 1999, we have been relying on market forces alone to lead to the construction of new plants. While there has been increased peaking generation capacity that has been built largely due to it being cheaper to build, it produces electricity at a higher cost than more efficient plants and is thus unlikely to provide much help in mitigating wholesale electric prices. The development in new baseload generation has been very minimal, and several factors may be discouraging the construction of baseload nuclear and coal-fired plants. Those plants have substantially higher capital costs than gas-fired peaking plants; are more likely to be the subject of community opposition; take longer to develop and construct; face greater

[12] PJM, 2006 Annual Report, p. 19.

market uncertainties as a result of that longer lead time; and face great uncertainty about future national and global constraints on carbon dioxide emissions, which in turn is making it more challenging to obtain financing.

CEEEP prepared Table 3 which shows the capital costs to build several types of power plants (the installed overnight costs), to keep those plants available to supply electricity (fixed operation & maintenance costs) and to generate electricity (variable operation & maintenance costs). Although nuclear power plants are by far the most expensive to build and keep available, once in place they also generate electricity more cheaply than any other non-renewable technology. These plants operate nearly 24/7 and provide the cheapest source of energy production. However, due to their high fixed operation costs and the stress that is placed on these facilities to power up or power down, it is difficult for them to respond to peak demand, and therefore they run at or near capacity for extended periods of time and provide electricity to meet baseload demand.

NJ Generation Cost Assumptions ($2008)								
	Overnight Installed Cost ($/kW)		Variable Operation & Maintenance Cost ($/MWh)		Fixed Operation & Maintenance Cost ($/kW-yr)		Heat Rate (MMBtu/kWh)	Capacity Factors
	Min	Max	Min	Max	Min	Max		Min
Conventional Coal	$2,300	$2,800	$3.50	$5.50	$24.00	$35.00	9,000	Determined by model
Integrated Gas Combined Cycle (IGCC)	$3,000	$4,500	$6.50	$7.50	$35.00	$45.00	8,350	
Advanced Combined Cycle	$900	$1,050	$2.00	$3.00	$6.50	$13.00	6,875	
Gas Turbine	$600	$800	$3.50	$6.00	$6.50	$8.50	10,750	
Nuclear	$4,500	$7,000	$0.65	$1.50	$80.00	$120.00	10,400	
Combined Heat and Power (CHP) (3-25 MW)**								
w/out Chillers	$1,000	$1,500	$4.00	$6.50	$30.00	$45.00	10,000	80%
w/ Chillers	approx. $2,000						10,000	80%
Wind								
On-shore	$2,000	$2,500	$1.00	$2.00	$30.00	$45.00	n/a	32%
Off-shore	$3,100	$4,100	$1.00	$2.00	$50.00	$100.00	n/a	34%
Biomass	$2,500	$3,500	$2.00	$4.00	$50.00	$60.00	14,250	85%
Solar	$5,000	$8,000	$0.00	$1.00	$11.00	$12.00	n/a	13.5%
	Min	Max						

Levelized Real Fixed Capital Charge Rate (%)	12%	15%	
Note: Costs in NJ are assumed to be 10% higher than rest of PJM			
Improvements in technologies and cost reductions are modeled consistent with those in the Annual Energy Outlook and other References			
** - Other cost assumptions related to Energy Efficiency (EE), and the Regional Greenhouse Gas Initiative (RGGI) are being finalized along with fuel price assumptions*			
*** - Variable and Fixed O&M costs for CHP decrease with installation size; units of 20+ MW face the min. costs* *Source: Cost Generation Taskforce 2007*			

Table 3: NJ Generation Cost Assumptions.

The amount of time needed to plan and construct these various generation technologies also differs greatly. According to the 2008 EIA Annual Energy Outlook, the "lead time" to construct these plants is as follows:

- Conventional Coal: 4 years.
- IGCC: 4 years.
- Advanced Combined Cycle: 3 years.
- Gas Turbine: 2 years.
- Advanced Nuclear: 6 years.
- Offshore Wind: 4 years.
- Onshore Wind: 3 years.
- Solar: 1-2 years.

The longer the lead time, the more regulatory risks are perceived for investment in these generation technologies. Therefore, due to its reduced capital costs, fixed operation and maintenance costs, and relatively short lead time, new gas turbines, that primarily serve peak demand have the greatest opportunity to be constructed. However, the cost to generate this electricity, their variable costs, is significantly higher, and results in higher electricity prices during the time they operate.

Deactivations and retirements of local power plants. According to the U.S. Energy Information Agency, New Jersey has about 17,000 MW of capacity currently operating in New Jersey. Figure 5 shows the age and MW capacity of New Jersey's electricity generating facilities in 2006.

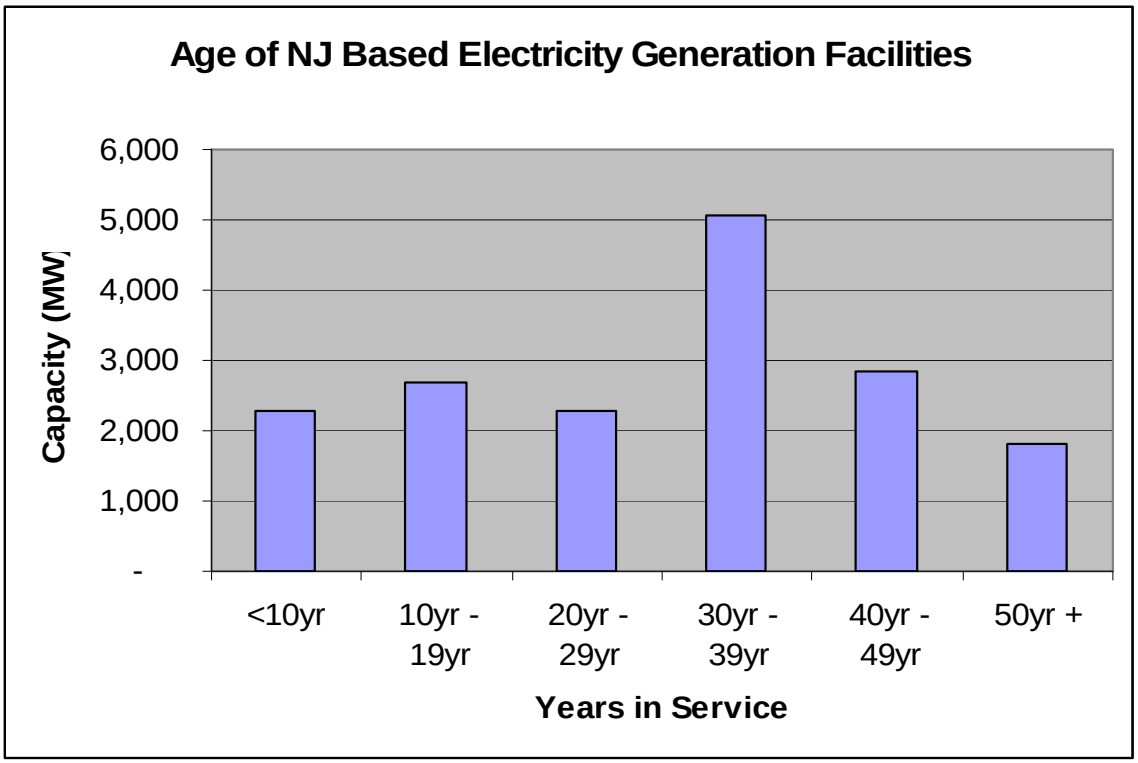

Figure 5: Age of NJ Based Electricity Generation Facilities. *Nearly half of New Jersey based electricity generating facilities is 30 years old or older.*[13]

Less than 40 percent of New Jersey's generation capacity is 20 years old or less, while over half is 30 years old or older. As existing power plants age, more are likely to retire, leading to an even greater challenge in providing enough capacity to satisfy peak demand. More than 400 MW of capacity retired between 2005 and 2007. Retirements of more than 3,000 MW of additional capacity had been announced; although about 2,100 MW of those retirements have been reversed at least temporarily, those plants are less reliable, less efficient, more expensive to run, and have greater greenhouse gas emission rates than newer plants.[14] In other words, these are not the kind of plants that New Jersey can rely upon for its energy future. We must plan for the likelihood that these plants will be retired and will either need to be replaced or electricity demand will need to be reduced to ensure the reliability of New Jersey's electricity supply.

Increasing exports to New York City and Long Island. Like New Jersey, New York City and Long Island suffer from a shortage of local generation capacity and limits on their ability to import electricity. A substantial part of their strategy to address that problem is to enter into contracts that support the development of new transmission lines over which they can import more power. As New York City and Long Island

[13] Energy Information Administration, "Form EIA-860 Database, Annual Electric Generator Report," 2006, available at http://www.eia.doe.gov/cneaf/electricity/page/eia860.html (accessed April 10, 2008).
[14] Energy Information Administration, "Form EIA-860 Database, Annual Electric Generator Report," 2006, available at http://www.eia.doe.gov/cneaf/electricity/page/eia860.html (accessed April 10, 2008); PJM, "PJM Generator Deactivations," "Withdrawn Deactivation Requests," and "Pending Deactivation Requests," http://www.pjm.com/planning/project-queues/gen-retire.html (accessed April 10, 2008).

import more electricity from and through New Jersey, our own shortfall of capacity to meet rising demand is exacerbated.

Before the "Neptune" transmission line from New Jersey to Long Island commenced operation, the United States Department of Energy said that the line "will move electricity from New Jersey to Long Island; the line will ease Long Island's supply needs, but it may exacerbate New Jersey's local reliability and supply problems."[15] When the Neptune line commenced operation in 2007, it immediately began withdrawing about 660 MW of capacity from New Jersey. This withdrawal was equivalent to an immediate retirement of about four percent of our current in-state generation, or about the capacity of the Oyster Creek nuclear plant. To look at it another way, activating the Neptune line had an instantaneous effect equivalent to two years' worth of increases in peak demand in New Jersey.

The Neptune line is not the end of the story. PJM states that with the Neptune line and other planned projects, the impact of growing peak demand is "compounded by the stresses on the transmission system of potentially having to accommodate more than 2,800 MW of planned exports of power from eastern PJM to New York City and Long Island. . ."[16]

In addition, the owner of one relatively new and efficient plant announced in January 2008 that it intended to "deactivate," making it unavailable to serve New Jersey customers. Instead, the owner hoped to export the plant's energy and capacity entirely to New York City, where electricity rates are higher, over a new transmission line. While this plant did not get the contract with New York, the ability of New Jersey based electricity generators to leave the PJM territory to supply electricity to New York remains a threat to reliability and price stability for New Jersey consumers.

Reliance on imports. New Jersey's generating plants produce about 75 percent of the state's annual electric consumption, thereby requiring the State to import the remaining 25 percent of its electricity. With exports rising, existing power plants retiring, and slow development of new plants locally, PJM has included in its transmission expansion plans several projects that will enable more imports of electricity from areas to the west and south. These long transmission lines are costly to build and more vulnerable to disruption than shorter lines linking local generation to local demand.

Attempts to solve New Jersey's reliability problems by importing more electricity are likely to increase greenhouse gas emissions and other air pollution challenges. Imported electricity is more heavily coal-based than electricity from New Jersey power plants, and therefore on the average has higher greenhouse gas emissions. Many of the out-of-state plants lack advanced technology to control air pollution and the prevailing winds carry that pollution here to the detriment of our air quality and public health.

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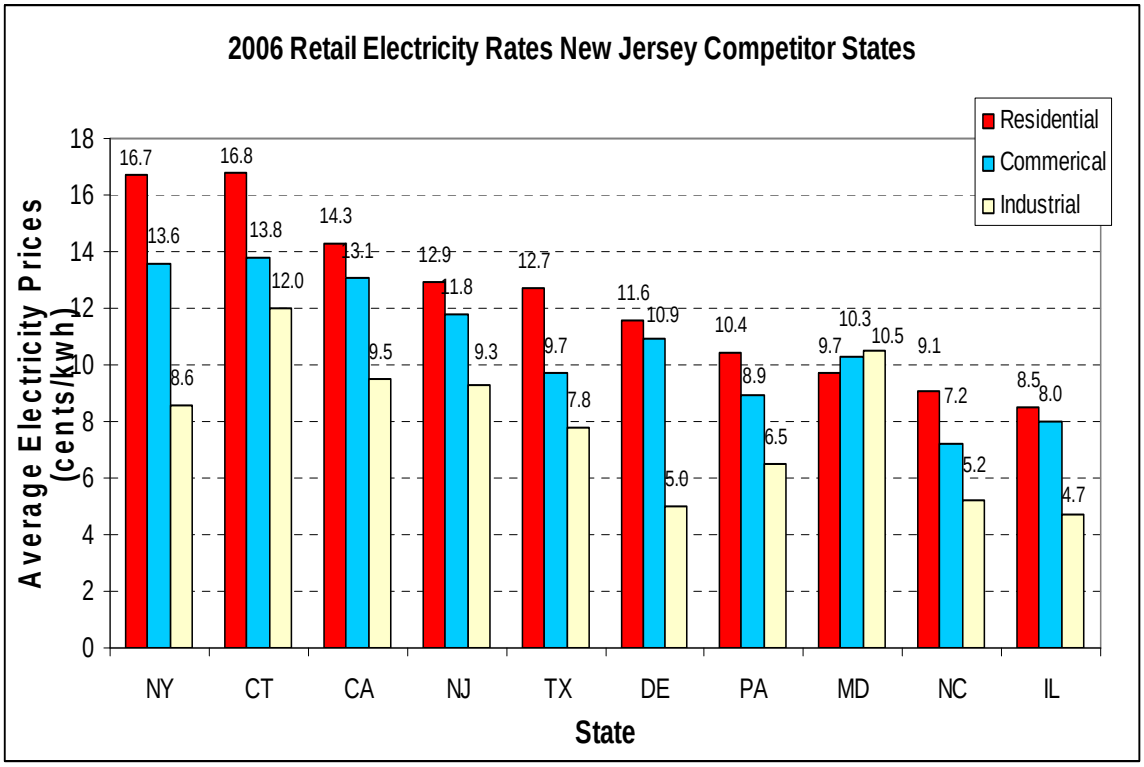
[15] U.S. Department of Energy, "National Electric Transmission Congestion Study," 2006, p. 42, http://nietc.anl.gov/documents/docs/Congestion_Study_2006-9MB.pdf (accessed April 10, 2008).
[16] PJM, "2007 Regional Transmission Expansion Plan," February 27, 2008, p. 223. p. 66

In addition, through its participation in RGGI, New Jersey based electrical generation facilities must purchase and use an allowance for each ton of carbon dioxide they emit. Although RGGI includes ten states, New Jersey, Maryland and Delaware are the only PJM states involved. Unlike generators in the RGGI region, the generation facilities in the other 10 PJM (including Pennsylvania, Ohio and West Virginia) states do not have to use allowances to cover their carbon dioxide emissions. The resulting cost advantage for generators outside the RGGI region may lead those generators to run more and emit more carbon dioxide, undermining RGGI's environmental benefits. This is commonly referred to as "leakage." Therefore, unless the State develops a strategy to mitigate leakage, the opportunity for a competitive advantage may lead generators to develop new plants in Pennsylvania, West Virginia, Ohio, and other states outside the RGGI region and export their power to New Jersey.

The prospect of increased greenhouse gas emissions is only one reason to avoid increasing our reliance on imports of out of state dirty electricity. Just as importantly, hopes that these imports would bring us greater reliability and lower prices are likely to be dashed. The prospect of federal limits on power plant emissions of greenhouse gases is creating major uncertainty about what coal-based power will cost. In addition, demand for coal is increasing, as coal is becoming more difficult and expensive to mine and transport, and recent history has featured disruptions in coal supply and spikes in coal prices. All of these factors suggest that unless a program aimed at providing incentives to lower carbon emitting electricity generation is enacted across the PJM territory, it would be irresponsible to stake our energy future on increased imports of out-of-state coal-based electricity.

ELECTRICITY PRICES

New Jersey's electricity prices are among the highest in the country. Figure 6 compares New Jersey prices to the prices in several other states. While prices in New York and Connecticut are higher, prices in other nearby states like Pennsylvania[17] are lower. Also, industrial electricity prices are lower in New York, Delaware, and Pennsylvania than in New Jersey. However, the electricity rates in Pennsylvania are expected to become comparable to New Jersey's rates when their rate caps are removed by the end of 2011.



Since electricity prices can be a substantial share of the cost of industrial production, this disparity makes New Jersey appear less attractive to industries either seeking to locate or expand a facility or deciding where to close a facility.

Figure 6: Comparison of Retail Electricity Rates. *In general, New Jersey's electricity rates are lower than those in the Northeast and California but higher than those of other Mid-Atlantic States.*

Although about a third of the retail rate pays for the cost of delivering the electricity and other utility-related charges, the bulk of the retail rate is simply a pass-through of costs of procurement on the wholesale electricity markets. For New Jersey customers and other states within PJM, that pass-through has increased dramatically over the past several years, from 5.06 cents per kWh in 2002 to 11.33 cents in 2008.

[17] For many electricity customers in Pennsylvania, electricity rates are capped. Rate caps have been common in states that transitioned to a competitive retail market for electricity; however, when the caps are eventually removed, drastic rate increases can result. For example, when rate caps ended in Maryland in 2006, Baltimore Gas & Electric rates for electricity increased by 72%.

Virtually all of this increase reflects increases in the prices of two products that power plants sell on the wholesale markets. The plants sell the electricity that they actually generate and supply to buyers, known as "energy"; and "capacity," which refers to the availability of plants to generate electricity during times of peak demand.

The ultimate wholesale buyers of these products are the companies that supply power to retail customers. Those retailers must purchase energy to supply their customers with the electricity they need; that amount changes constantly with changes in the customers' demand, and the wholesale spot market price of energy changes constantly as well. PJM also requires that the retailers purchase enough capacity to meet their customers' highest projected peak demand, plus a reserve to protect against the possibility that some plants may be unavailable when the peak actually occurs.

Buyers and sellers are free to negotiate contracts directly with each other for the sale of either energy or capacity. Nonetheless, the prices set in the markets, and the expectations of trends in those markets, guide the prices that buyers and sellers will be willing to agree upon in their contracts.

Energy and capacity in "regulated" vs. "deregulated" states. In "regulated" states where electric utilities still own power plants that are regulated by a state utility commission, the utilities can supply their own needs for energy and capacity or strike a balance between self-supply and purchases on the wholesale markets. The utilities make those decisions under the oversight of the state utility commission. That commission also regulates the retail prices that utilities charge for electricity. Those retail prices reflect the utilities' actual cost of producing self-supplied energy. It also reflects the recovery of capital costs for the self-supplied capacity, plus a return, as well as the fixed operating and maintenance costs needed to keep that capacity available. In this scenario, consumers bear the financial risks of decisions that result in above market costs.

New Jersey regulated electric utilities in this manner before Governor Whitman signed EDECA into law in 1999. At that time, New Jersey's three largest electric utilities owned power plants, which were regulated by the BPU. After the law was enacted, all utilities divested themselves of ownership of their power plants, removing them from the regulatory jurisdiction of the BPU. PSE&G conveyed its plants to an affiliate, known as PSEG Power LLC; the other utilities sold their plants to unrelated companies.

Under EDECA, retail customers can choose the supplier from whom they will purchase their electricity, or can do nothing and receive "default" service provided to customers who do not choose an alternative supplier. That service is known as the BGS auction. State utility regulators approve the retail price for BGS, while competitive retailers set their own retail prices. For both BGS and competitive retailers, fluctuations in the retail price of electricity largely follow fluctuations in the wholesale costs of energy and capacity. The wholesale markets that set these prices are regulated by the Federal Energy Regulatory Commission rather than by the State.

Wholesale energy and capacity markets. The wholesale spot market prices of energy and capacity, which are the largest influence on the retail price of electricity in New Jersey and other "deregulated" states, are not based on the actual cost of supplying those products. Instead, the spot market sets a "clearing price" for energy, and one for capacity as well; all participating power plants get paid that clearing price, including plants with variable operating costs that are well below the clearing price.

In the spot market for energy, the clearing price is generally set by the most expensive power plant called upon to run at a given time. PJM calls upon plants to run ("dispatches" the plants), starting with the one that offers to supply energy most cheaply, and working up through plants with more expensive offers, until there is enough power being generated to satisfy demand at all locations of the PJM grid. All plants running at that time receive the price offered by the last, most expensive plant – even plants that offered to supply energy at a far lower price.

The cost of power from a particular plant depends primarily on how much its fuel costs, and how efficiently the fuel is used to generate electricity. Since nuclear plants generate each additional megawatt-hour of electricity at a very low cost (even though they are significantly more expensive to build and maintain than their fossil-fueled counterparts), they are generally the first plants dispatched. Coal plants are usually dispatched next. Combined-cycle plants fueled by natural gas (and sometimes with oil) generate additional electricity by reusing heat that would otherwise be wasted, and are therefore more efficient and dispatched ahead of simple-cycle combustion turbines that do not reuse their waste heat.[18]

Prices vary by location. New Jersey is part of a region within PJM (also including Delaware, Maryland, the District of Columbia, southeastern Pennsylvania, and northern Virginia) with limited ability to import power. This region therefore must rely at times on more expensive local plants to meet demand instead of less expensive plants to the west. Since it is the most expensive plant that sets the price for all plants running in the area, the limits on imports make energy more expensive here than in regions such as western Pennsylvania, Ohio, and West Virginia where less expensive coal-based power is more readily available.

On peak demand days, the need for more electricity triggers the activation of higher-cost generation facilities, called "peaking plants." Although these generating facilities are only needed a small number of hours per year, consumers pay year-round for the ability to call on these peaking plants. In addition, when these peaking plants are running, their higher costs set the price for all other plants running in the area at the same time – even plants that generate electricity much less expensively.

[18] Like nuclear plants, renewable facilities fueled by the wind or the sun are more costly to build but less expensive to run – since those renewable resources are essentially free. However, since they generate electricity intermittently based on how strongly the sun is shining or the wind is blowing, PJM cannot call upon them to supply a certain amount of electricity at a particular time.

Electricity customers directly bear the cost of expanding the capacity of transmission and distribution infrastructure. Conversely, if actions are taken that convincingly reduces, eliminates, or reverses projected increases in the highest peak demands, customers will pay less for the expansion of infrastructure.

Through the capacity market, customers bear some of the cost of expanding generation infrastructure. New electric generation capacity will be built in New Jersey only if the developers of that capacity and their financiers expect that a new plant will earn enough revenue to cover the cost of operating and maintaining the plant, and to pay back their upfront investment in a reasonable amount of time. Currently, power plant developers depend in part on the capacity market for that revenue.

Unlike the energy market, which has operated without dramatic changes in recent years, the capacity market in PJM underwent drastic changes in 2007. Before the changes, the price for capacity was very low, as a result of flaws in the market that PJM then sought to correct. PJM developed a new capacity market construct, called the Reliability Pricing Model (RPM) as a means to have capacity payments provide much of the revenue that new plants would depend upon to pay back their upfront investments. PJM also sought to support the retention of marginal power plants on the verge of retiring, and to provide a sufficient incentive for demand response.

With those goals in mind, RPM was designed to ensure higher and more stable capacity prices, especially in areas such as New Jersey and the Baltimore-Washington corridor, where PJM believed that shortages of capacity resources were threatening the reliability of the supply of electricity. Capacity prices under RPM, like energy prices, are therefore supposed to vary by location.

RPM does not target new plants, but instead spreads capacity payments amongst all new and existing plants. Paying all existing plants a capacity price that PJM hopes to be high enough to effectively encourage new plants will cost electricity customers billions of dollars more than a better-targeted effort. Five RPM auctions have been held, establishing capacity prices for the five years from July 1, 2007 through June 30, 2012, at a total cost of more than $7 billion for New Jersey customers alone. With capacity costs now accounting for about 15 to 20 percent of the price of electricity in New Jersey, strategies to reduce excessive capacity costs are an essential part of efforts to reduce electricity prices. For this reason, the BPU will continue to challenge RPM in the federal courts.

At the same time, we must recognize that RPM is already a fact of life, which is already helping to set the price of electricity through 2012. New Jersey and several neighboring states have already recognized the importance of energy efficiency, demand response, and clean local generation in a more sustainable and affordable energy future. We will continue to work with PJM to adjust RPM so that it supports those resources appropriately. We will also continue to work with PJM on other aspects of the RPM construct that will help to control costs.

The four electric utilities in the State procure energy, capacity, and all other electricity requirements from the wholesale market to serve virtually all but the largest industrial and commercial electricity customers. The utilities procure those products through an annual BGS auction, under rules and procedures approved by the BPU and under the oversight of the BPU. The utilities have conducted these auctions since 2002. Each year, the BPU has worked closely with stakeholders to identify and implement possible improvements to the auction.

In each annual BGS auction, the utilities procure three-year contracts for electricity supply, for one-third of supply needed. In that way, the BGS price each year reflects an average of procurements made over three years. The three-year average exposes New Jersey customers to less of the volatility in the wholesale electricity markets. However, the three-year average has steadily increased over the past several years.

Threat of continuing increases in wholesale energy and capacity prices. Several factors will combine to push wholesale energy and capacity costs higher unless policies are enacted to counteract them:

- Growth in the supply of electricity is not keeping up with growth in demand.
- More of the State's power plants are fueled by natural gas.
- Capacity prices now contribute substantially to increasing electricity bills.
- Substantial increases in fuel prices.

Growth in the supply of electricity is not keeping up with growth in peak demand. As discussed above with respect to threats to reliability, growth in capacity is not keeping up with growth in peak demand, while retirements of existing plants and increasing exports to New York City and Long Island make the shortage of capacity worse. When increasing peak demand meets an increasing shortage of the supply of capacity, higher capacity prices are likely to result.

More of our power plants are fueled by natural gas. New Jersey's electric generation fleet has changed over time, with plants fueled by natural gas generating a larger share of the State's electricity generation. Figure 7 illustrates the cost for each type of plant to generate one megawatt-hour of electricity, and how plants are called upon to provide electricity to the grid in order of their increasing costs as the demand for electricity increases.

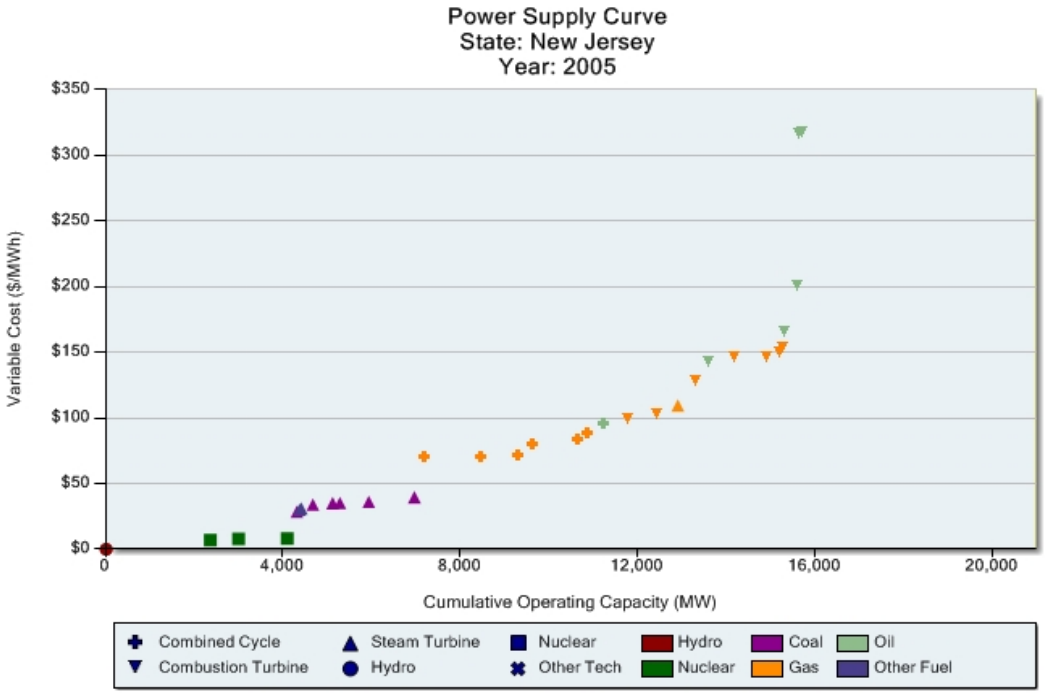


Figure 7: 2005 Power Supply for New Jersey. The plants with the highest operating costs (oil and natural gas) set the price of electricity that all plants receive.

Hydroelectric plants generate a megawatt-hour at the lowest cost, followed by nuclear and coal. Combined-cycle plants, which use a natural gas-fueled combustion turbine to generate electricity, and then recover heat from the turbine exhaust to generate steam that can be used to generate more electricity, are next in line. Peaking units, such as natural gas-fueled or oil-fueled older boilers, and simple-cycle combustion turbines that do not recover waste heat, have the highest cost to generate a megawatt-hour of electricity.

The most expensive plant called upon to run at a given time sets the price for all plants running at that time. When plants fueled by more expensive fuels such as natural gas are called upon to meet New Jersey's demand for electricity more of the time, they set a higher price for all plants running at the time. Accordingly, heavier reliance on natural gas combined with increases in the price of natural gas contributes heavily to higher electricity prices.

The large majority of the 226,505 MW of new generation plants, that commenced operation nationwide since 1997, are fueled by natural gas. Figure 8 shows the amount of electric generation capacity that has been installed nationwide in the last 50 years.[19]

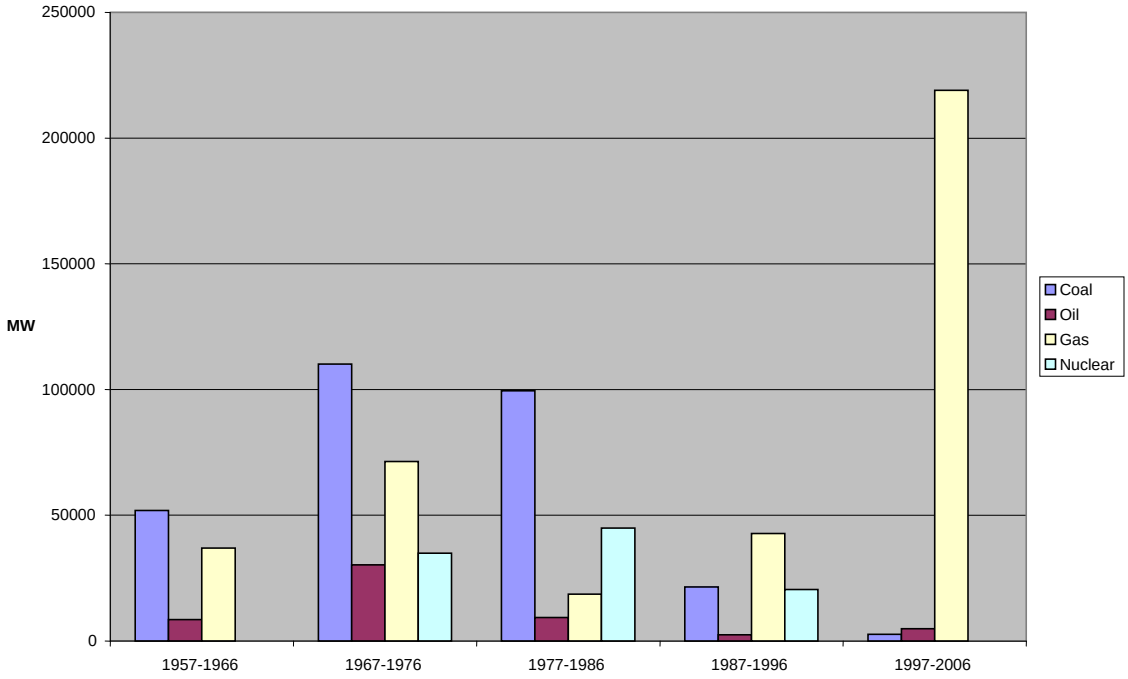


Figure 8: Electricity Generation Capacity Nationwide, by Fuel Type and In-Service Date.[20]

This trend is similar in New Jersey. Figure 9 shows the amount of electric generation capacity that has been installed in the State in the last 50 years.[21] In 1990, power plants fueled by natural gas accounted for about 33% of New Jersey's electric generation capacity; by 2006, that share had grown to about 55%.[22] Those plants not only account for a larger share of the generation capacity, but also generate a larger share of our electricity. Natural gas generation facilities accounted for 17.3% of the State's total electricity generation in 1990, and 25.8% in 2006.[23]

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[19] Energy Information Administration, "Form EIA-860 Database, Annual Electric Generator Report," 2006, available at http://www.eia.doe.gov/cneaf/electricity/page/eia860.html (accessed April 10, 2008)

[20] Energy Information Administration, "Form EIA-860 Database, Annual Electric Generator Report," 2006, available at http://www.eia.doe.gov/cneaf/electricity/page/eia860.html (accessed April 10, 2008)

[21] *Id.*

[22] Energy Information Administration, New Jersey Electricity Profile, November 2007, Table 4, Electric Power Net Summer Capacity by Primary Energy Source and Industry Sector, 1990, 1995, and 2001 Through 2006, http://www.eia.doe.gov/cneaf/electricity/st_profiles/new_jersey.pdf (accessed April 15, 2008).

[23] Energy Information Administration, New Jersey Electricity Profile, November 2007, Table 5, Electric Power Net Generation by Primary Energy Source and Industry Sector, 1990, 1995, and 2001 Through 2006, http://www.eia.doe.gov/cneaf/electricity/st_profiles/new_jersey.pdf (accessed April 15, 2008).

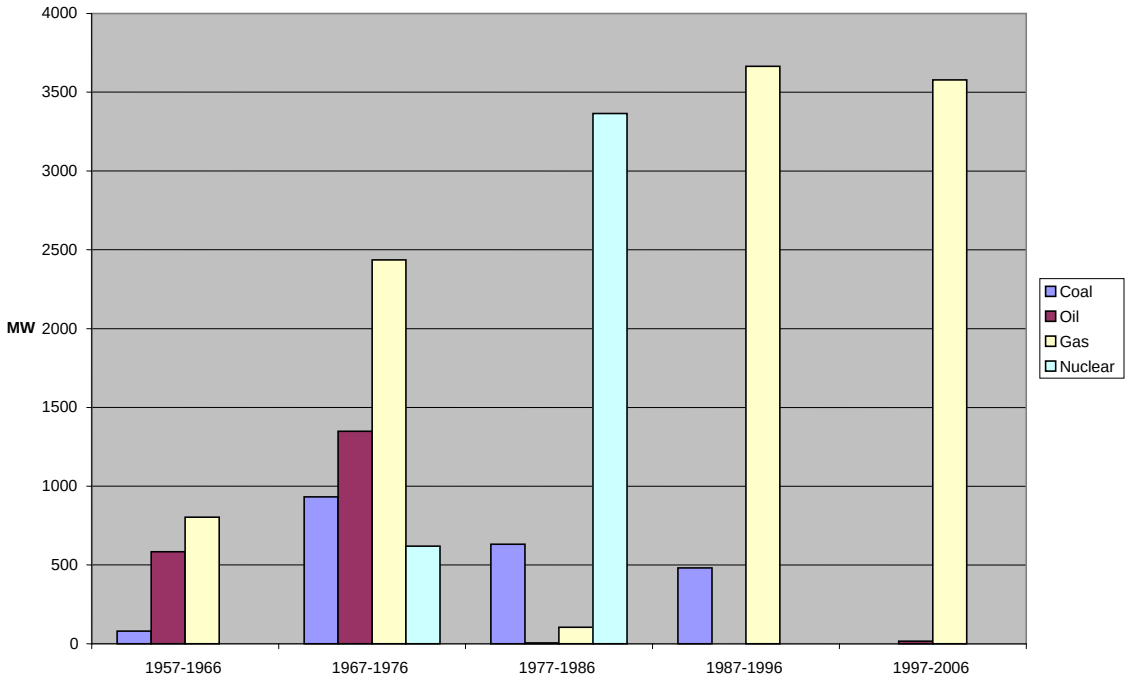

Figure 9: Electricity Generation Capacity in New Jersey, by Fuel Type and In-Service Date.[24]

In contrast, nuclear plants, which generate electricity at a much lower cost for each megawatt-hour, provided 26.6% of capacity in 1990 but only 21% in 2006. Despite accounting for only about one-fifth of the electric generation capacity in New Jersey, nuclear plants continue to produce over half of the electricity generated here. However, their share has dropped from about 60% in 1990 to about 54% in 2006.

Increases in natural gas prices over the past several years makes those plants substantially more expensive to operate than plants using cheaper fuels, contributing to higher energy prices. Figure 10 shows the increase and volatility of natural gas prices in New Jersey through May 2008; the price of natural gas has risen more than tripled since 2002 for electricity generation and industrial customers.

[24] Energy Information Administration, "Form EIA-860 Database, Annual Electric Generator Report," 2006, available at http://www.eia.doe.gov/cneaf/electricity/page/eia860.html (accessed April 10, 2008)

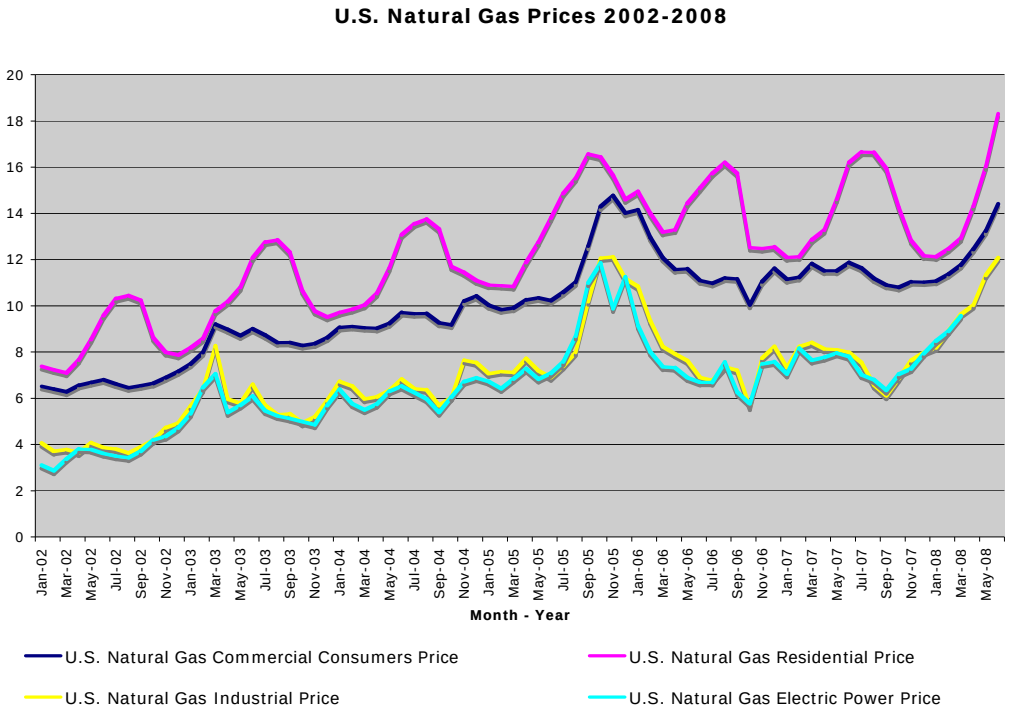

Figure 10: New Jersey Natural Gas Prices Sold to All Customer Classes. *The price of natural gas has increased 200% for Industrial and Electric Power customers since January 2002 with increased demand expected over the next decade.*[25]

In total, prices have tripled since January 2002, with significant spikes in 2005 and 2008 due only in part to heightened hurricane activity in the Gulf of Mexico.

A shift to coal-based generation offers little promise of lower prices. Although the urgent need to combat global warming precludes such a step, increasing our reliance on coal-based electricity offers no sustained promise of lower electricity prices.

East of the Mississippi, coal is becoming progressively more expensive to mine. The more easily mined coal, at shallower depths and in locations with a higher ratio of coal to "overburden" such as rock and soil, has already been extracted. Mining becomes more complex and more expensive when the seams of coal are located at greater depths, and where overlying or underlying seams have already been mined. Therefore, coal production east of the Mississippi has been declining (see figure 11).[26]

[25] Energy Information Administration, Monthly Wholesale and Retail Prices, Natural Gas, 2002 through 2006 available at http://tonto.eia.doe.gov/dnav/ng/ng_pri_sum_dcu_nus_m.htm (accessed September 20, 2008).

[26] National Research Council of the National Academies, "Coal Research and Development to Support National Energy Policy," 2007, p. 66; Figure 13, p. 59.

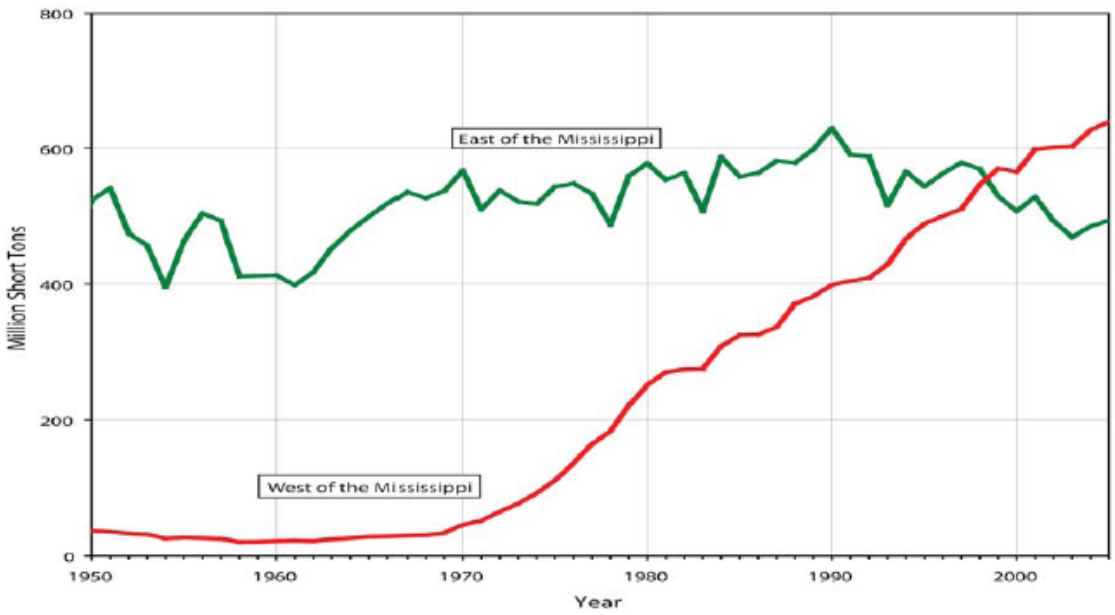

Figure 11: Domestic Coal Production Across the United States. *The amount of coal production west of the Mississippi has increased dramatically while the coal production east of the Mississippi has declined steadily since 1990.*

Figure 11 also illustrates the large and sustained growth of coal production west of the Mississippi. However, coal delivered over long distances from this region is vulnerable to disruptions in supply and spikes in price due to weather and other natural phenomena, such as earthquakes, fires, and floods. For example, when two coal trains derailed in May 2005, coal shipments were reduced for the rest of the year; the spot price of coal from the region more than doubled in just five months.[27]

With these problems in mind, it is unsurprising that coal prices, though currently much less expensive then natural gas, have increased 45% since January 2002 (see Figure 12). Growing worldwide demand for coal is likely to increase prices further; a doubling of world coal prices in 2008-2009 has been forecasted.[28]

Also, any meaningful future federal constraint on greenhouse gas emissions from power plants will significantly increase the cost of generating electricity from coal. The prospect of such a constraint is making it more challenging to obtain financing for new coal-based plants.

[27] Id., p. 83.
[28] Forbes.com, "Coal Prices May Double In Coming Year," February 5, 2008, http://www.forbes.com/2008/02/05/coal-supply-pressures-markets-comm-cx_vk_0205markets01.html (accessed April 10, 2008).

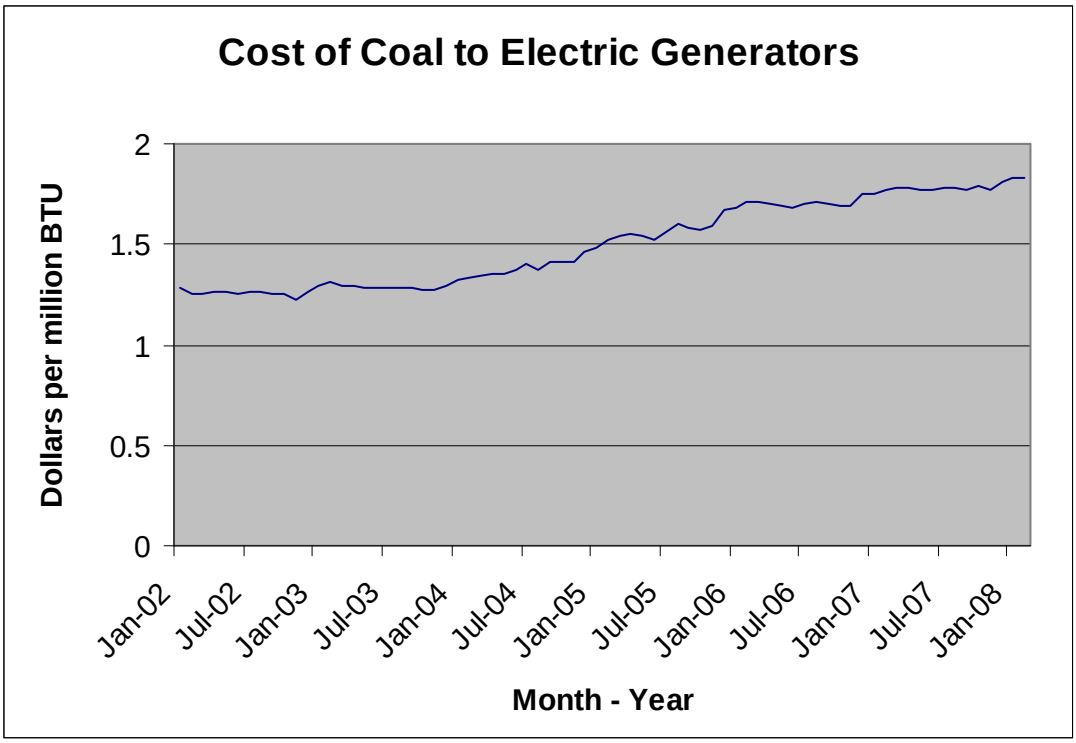

Figure 12. Cost of Coal to Electric Generators. *Since January 2002, the cost of coal to electricity generators has increased nearly 45%. This increase is expected to continue.*[29]

In response, a group of financial institutions recently developed guidelines to deal with the regulatory uncertainties concerning regional and national climate change policies. In February 2008, Citigroup, JPMorgan Chase, and Morgan Stanley announced the formation of The Carbon Principles, climate change guidelines for advisors and lenders to power companies in the United States. The Principles, developed by those three institutions in consultation with, and in consultation with American Electric Power, CMS Energy, DTE Energy, NRG Energy, PSEG, Sempra, Southern Company, Environmental Defense, and the Natural Resources Defense Council, creates an approach for a rigorous analysis of the carbon risks in power plant investments.[30]

The fight against global warming makes it imperative that we avoid planning an energy future based on increased imports of coal-based electricity from the Midwest and Southeast. For the reasons discussed above, major investments in infrastructure designed to facilitate those increased imports would be economically unwise as well as environmentally irresponsible.

Capacity prices will continue to be set through RPM. As noted above, the first four years of RPM will cost New Jersey electricity customers nearly $7 billion. The BPU is challenging RPM, as it is currently structured, in federal court and will continue to advocate for a more cost-effective method to encourage the increase of electric

[29] Energy Information Administration data from January 2002 through February 2008.
[30] Citigroup Inc., Press Release, "Leading Wall Street Banks Establish the Carbon Principles," February 4, 2008, http://www.citigroup.com/citigroup/press/2008/080204a.htm, accessed April 10, 2008.

generation capacity that is consistent with the New Jersey's environmental policies, into the New Jersey market.

Since the retail price of electricity generally tracks wholesale prices, and most importantly the wholesale prices of energy and capacity, efforts to reduce electricity costs to New Jersey customers must focus on strategies likely to lead to lower wholesale energy prices, lower wholesale capacity prices, or both.

HEATING FUEL CHALLENGES

Natural gas and oil are nonrenewable sources of energy that are used primarily for heating, generating electricity and as a transportation fuel. Domestic consumption of natural gas comes primarily from wells within the U.S. but it is also imported from other countries. Most of these imports are delivered via pipeline from Canada and Mexico, but to move natural gas from countries that are further away, the natural gas is required to be turned into a liquid (also called "Liquefied Natural Gas" or LNG) by "supercooling" and transported as a liquid on tankers before being warmed up and turned into a gas upon arrival in the United States.

Heating oil in the United States is primarily supplied by domestic refineries and imports from other countries such as Canada, the Virgin Islands and Venezuela. The domestic refineries produce heating oil as part of its "distillate fuel oil" production which includes diesel fuel. These heating oils are distributed by barges, tankers, trucks, rail and pipelines. The refineries that produce this heating oil often use the summer months, when demand is the lowest, to build up inventories so that there is sufficient inventory during the coldest winter months. However, in order for the refineries to increase their heating oil output they also have to increase their output of other petroleum products which there may not be a sufficient market for during these cold months. Also, if there is increased demand for gasoline, which was the case after Hurricane Katrina in 2005, these refineries may forgo producing heating oil in order to produce more gasoline, which will limit available supplies during the winter months.

This factor contributes to the recent increases in heating oil over the last several years, but also compromises the reliability when consumers need it most to heat their homes. The cost of heating oil to residential customers, in the northeast has increased more than 200% since January 2002. The EIA estimates that as much as 60% of these fuel costs are determined by the price of crude oil, with another 24% of these costs accounting for the distribution and marketing costs.

The EIA further estimates that nationwide, households heating primarily with natural gas are expected to spend an average of $155 (18 percent) more this winter. The EIA also estimates that nationwide, households heating primarily with heating oil can expect to pay an average of $449 (23 percent) more this winter.[31]

[31] EIA, "Short-Term Energy and Winter Fuels Outlook - October 7, 2008 Release," http://www.eia.doe.gov/steo, accessed October 8, 2008.

Figure 13 shows the monthly cost of heating oil to residential customers during this period of time. Also, natural gas prices to residential customers have increased nearly 250% percent during this same time period as indicated on Figure 10.

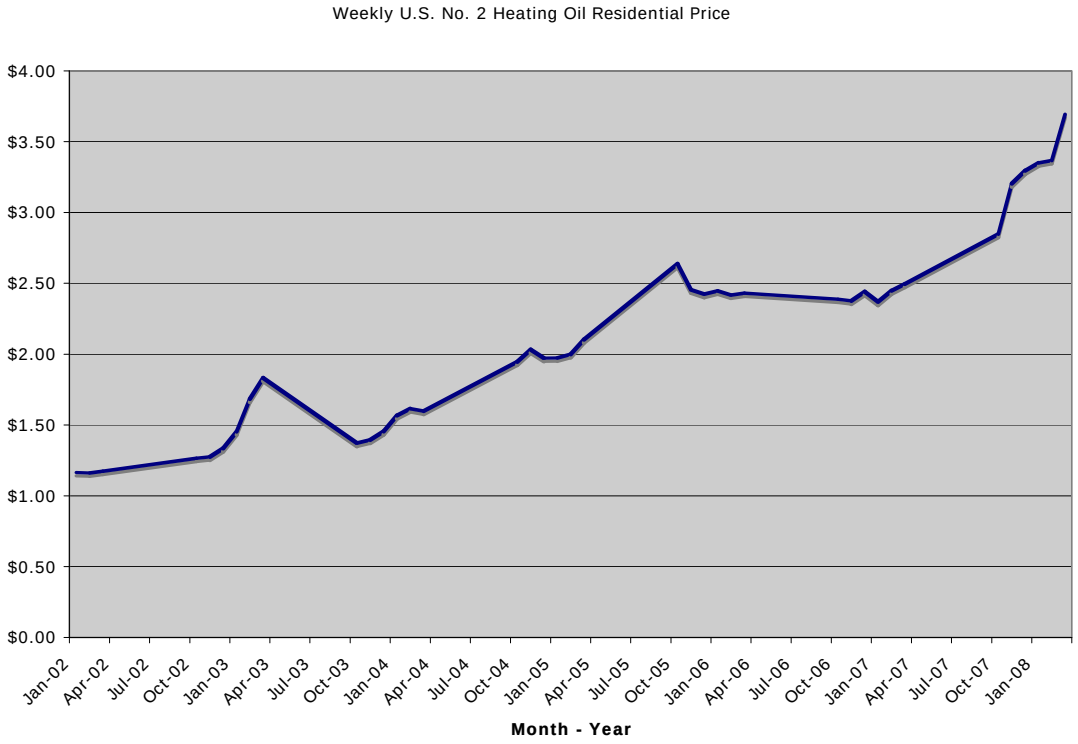

Figure 13: Heating Oil Residential Retail Prices*. Prices have increased for residential customers in the northeast more than 200% since January 2002.*[32] *These prices exclude taxes.*

Unlike the price of electricity, the prices of heating oil and natural gas are essentially immune to any influence by New Jersey. Since electricity cannot yet feasibly be stored in large quantities and must be generated and delivered to the customers who need it almost simultaneously, the local conditions affect electricity markets significantly, making those markets amenable to some local influence. In contrast, the markets for heating fuels are national and global in character. Prices on those markets respond to national or global supply and demand, and New Jersey's actions alone will not noticeably affect those prices.

Since the commodity prices cannot be expected to respond to New Jersey actions, strategies to reduce the cost of heating fuels to Jersey homes, businesses, and institutions are conceptually much simpler than strategies to reduce electricity costs. Most importantly, reducing costs depends on reducing consumption, through efficiency and through conservation. With respect to natural gas, longer-term reductions in consumption makes it possible for gas utilities to ensure reliable supplies with less cost for the capacity needed to transport and store sufficient natural gas.

[32] Energy Information Administration data from January 2002 through March 2008.

Also, like electricity, the use of heating fuels is contributing to global climate change. Like electricity, reducing consumption through efficiency and conservation reduces that contribution. Recent volatility and large spikes in the prices of crude oil and natural gas are discussed elsewhere in this document and are widely known. Using those fuels as wisely as possible is the best way to protect ourselves from future price spikes.

The CEEEP and R/ECON™ have projected total heating fuel costs for New Jersey for 2020. Under the "business as usual," without changes in State actions, based on EMP projection of the State's 2020 demand for heating fuels (natural gas and heating oil) of 542 trillion BTU, CEEEP and R/ECON™ projects a cost of over $1,800 per household.

"BUSINESS AS USUAL"SCENARIO

The CEEEP and R/ECON™ at Rutgers University have projected total electricity costs for New Jersey for 2020. Under the "business as usual" scenario, without changes in State actions, the EMP projects that in 2020, New Jersey's homes and businesses will use 97,800 GWh of electricity and over 542 TBTUs of natural gas and heating oil. Under this scenario in 2020, customers will spend $30.7 billion on energy costs, and the average household will spend over $1,700 on electricity, and over $1,800 on heating fuels (natural gas and heating oil). It is projected that commercial businesses would face a 101 percent increase in electricity costs, while industry costs would increase by 30 percent. As a result of this energy environment, it is estimated that under the business as usual model, New Jersey's energy infrastructure would be responsible for up to 84 million metric tons of carbon dioxide.

Addressing the State's energy challenges will first require slowing the growing electricity demand. Energy efficiency offers the most financially and environmentally responsible solution to these challenges. Increasing energy efficiency will by definition strengthen the State's economy, as it will result in homes and businesses using energy more efficiently and effectively doing "more with less." To do this, the State will need to expand its energy efficiency and conservation initiatives to reduce the energy demand that would necessitate the construction of new energy generation facilities or increase the reliance on imported energy from other states.

Unfortunately, energy efficiency and conservation will not fully meet the State's energy demand. The combination of aging power plants, lack of new baseload generation, increasing exports, and reliance on imports over long transmission lines, demands action from the State to ensure a competitively priced and reliable energy infrastructure in the future. Therefore, the State must continue to address its energy challenges by developing policies that maintain and ensure that sufficient electricity generation capacity is available to meet demand, while remaining consistent with the State's greenhouse gas emission policies.

Given the current 2020 projections, the development of new cogeneration plants, renewable energy and reduced peak demand will be effective at satisfying this demand. The development of a State Energy Council will help the State be responsive to energy challenges as they may arise, including an imbalance of supply and demand.

PLAN FOR ACTION

New Jersey must implement a series of well-developed, long-term action items that will effectively create an energy infrastructure that is clean, competitively priced and reliable and responsive to the following energy challenges:

- Energy demand is outpacing energy supply.
- The price of electricity continues to rise.
- The serious threats of global climate change, and the need to assure that New Jersey's energy policies do not, to the greatest extent possible, contribute to this problem.
- New Jersey does not have complete jurisdictional control of its energy infrastructure and energy future.

The economic and environmental consequences of not addressing these challenges, the "business as usual" scenario, are tremendous:

- PJM forecasts, that the State's electricity reliability could be jeopardized.
- Energy prices will continue to rise, costing New Jersey customers $30.7 billion, which is 96% more in 2020 than in 2005.
- The State's contributions to global climate change will increase resulting in, among other things, a significant rise in sea level, whose effects could be detrimental to coastal states like New Jersey.
- New Jersey's economy will continue to depend on an unsustainable and outdated energy system.

An understanding of these challenges makes it clear what types of goals need to be pursued to answer those challenges.

1. Maximize the State's energy conservation and energy efficiency to achieve reductions in energy consumption of at least 20% by 2020 resulting in a reduction in our current energy consumption.
2. Reduce peak demand for electricity by 5,700 MW by 2020.
3. Stimulate growth in renewable and alternative energy technologies by pursuing action items that may result in New Jersey producing 30% of its energy supply from renewable energy sources by 2020.
4. Develop a 21st century energy infrastructure that is responsive to the goals and action items in this plan, ensures the reliability of the system, and makes available additional tools to consumers to manage their energy consumption.
5. Invest in innovative clean energy technologies, businesses and workforce to stimulate the growth in the clean energy industry in New Jersey.

The DEP is currently working on its Global Warming Response Act Plan, which will provide a plan for the State to meet its 2020 and 2050 greenhouse gas emission targets. While this Plan will include many of the energy related action items that are listed here, it will also propose changes to the State's land use policies, transportation sector and other initiatives that focus on the 2050 goals.

GOAL 1: Maximize the State's energy conservation and energy efficiency to achieve reductions in energy consumption of at least 20% by 2020.

The success of a business is often determined by its ability to produce more while using fewer resources than its competitors. New Jersey is faced with a similar challenge, in that its future competitiveness depends on creating an energy environment that encourages its homes and businesses to be more efficient in their consumption of electricity. Currently, there is a tremendous amount of energy that is wasted due to inefficient appliances, poor insulation, or unnecessary usage, such as lights being left on. We must change the way we think about energy, and must find ways to "do more with less" by growing the State's economy while increasing its overall efficiency.

Even if the prices of electricity and heating fuels were never to increase again, unabated growth in our overall demand for those products would increase our cost. Buying more of the same product, even if the price is unchanged, costs more. Cutting our overall demand for electricity and heating fuels will cut our energy costs.

Unabated growth in our overall demand for electricity means that we will call on more expensive supplies of electricity more of the time, leading to higher electricity prices. Cutting our overall demand will mitigate the trend toward higher prices. In addition, if current trends continue and our growing demand for electricity is to be met largely by power plants fueled by natural gas, then unabated growth in our demand for electricity will put a growing strain on supplies of natural gas, reinforcing trends toward higher natural gas prices for heating and for electric generation.

Conservation and energy efficiency are the most economical methods of lowering energy costs. By using less energy by turning off lights in empty rooms and replacing incandescent light bulbs with compact fluorescent light bulbs, the entire state benefits from savings on electric and heating bills through decreased energy demand.

Reducing electricity demand leads to increased reliability for New Jersey's electricity grid, which in turn reduces the potential for brownouts and blackouts. Reducing electricity demand also lowers the need to generate electricity leading to a decrease in New Jersey's air pollution and greenhouse gas emissions.

To reach the aggressive goal set forth in this plan, more must be done to accelerate the rate of energy efficiency implementation across all sectors. Therefore the following initiatives are proposed to achieve the energy efficiency goal:

- Redesign and transition the State's current energy efficiency programs to be implemented by the electric and gas utilities, and achieve the desired results by targeting all cost-effective efficiency in homes, buildings and industry.
- Increase energy efficiency in new buildings with a statewide building code that will make new construction at least 30% more energy efficient than buildings under current State code by the end of 2009.

- Increase energy efficiency in homes and buildings through enhanced energy efficiency standards for new and replacement appliances and other types of equipment currently not covered by existing standards beginning in 2009.
- Increase awareness about the importance of energy conservation and energy efficiency upgrades by developing an education and outreach program for the public.

ACTION ITEM 1: Redesign and transition the State's current energy efficiency programs to be implemented by the electric and gas utilities, and achieve the desired results while remaining cost-effective.

If New Jersey is going to meet its aggressive energy reduction goals, it will need to dramatically increase the implementation of energy efficiency and energy conservation measures in its existing building stock. Therefore, the State will move forward with transitioning these energy efficiency programs to the electric and gas utility companies to implement.

Through the BPU's New Jersey Clean Energy Program, the State has been investing in energy efficiency and renewable energy projects around the state with tremendous success. This program is currently funded by a societal benefits charge that is currently placed on consumers' electricity and natural gas bills. The Clean Energy Program reinvests these dollars into energy efficiency and renewable energy projects.

Between 2001 and 2007, the New Jersey Clean Energy Program, assisted in avoiding 1,428 GWh of electricity consumption, and 3.1 trillion BTUs of natural gas usage. These savings were broken down between the following electricity consumer groups:

- 64.5% of the electricity savings and 32.2% of the natural gas savings were through the commercial and industrial energy efficiency program.
- 35.5% of the electricity savings and 67.8% of the natural gas savings were through the residential energy efficiency program.

Customers saved about $11 for every dollar spent in the commercial and industrial energy efficiency program. Customers saved about $4 for every dollar spent in the residential energy efficiency program.

Further energy efficiency efforts must target both new buildings and existing buildings. Changes in building codes can ensure that new buildings will be more energy-efficient; however, existing buildings must be targeted one by one for energy efficiency upgrades. Cost-effective improvements to energy efficiency in all of the 3.7 million existing buildings already in place could save more than 15,000 GWh of electricity by 2020, as well as nearly 75 trillion BTUs of heating fuels.

Improving energy efficiency in 3.7 million existing buildings by 2020 involves a massive effort to address more than 300,000 buildings each year. In contrast, energy efficiency efforts under the current Clean Energy Program between 2001 and 2007 reached

approximately 500,000 buildings; those efforts targeted specific types of energy efficiency improvements rather than comprehensively improving energy efficiency throughout the whole building.

Accordingly, improving energy efficiency in almost all of those existing buildings will depend on education and outreach to the owners and leasers of those buildings, a means of identifying the energy efficiency opportunities in each building, and a means of delivering the improvements in a way that is advantageous to the owners and lessees. Such services must provide whole solutions that integrate cost-effective efficiency for the building envelope (such as windows, walls, and doors), heating and cooling systems, lighting, appliances and electronics, and provide the opportunity to offset power requirements though combined heat and power, photovoltaic systems, fuel cells and other site-based clean energy generation.

The utilities can be extremely effective at meeting the State's energy consumption targets because:

- They have tremendous access to the State's more than 3 million buildings.
- They can be held to an energy consumption standard to ensure that the goal will be accomplished.
- They will be able to structure financial arrangements with customers that are innovative such as energy savings contracts to do the work that is necessary.

Electric and gas utilities' relationships with their customers position them to help those customers improve the energy efficiency of existing buildings. The gas and electric utilities will be responsible for developing an energy efficiency program to be submitted to the BPU staff for consideration that would put the State on the track to meet its 2020 energy consumption goals. The electric and gas utilities will be responsible for developing energy efficiency programs that compliment each other and that are simple and cost effective for the end user.

As part of its review of the program and the utilities' cost recovery, the BPU staff will consider the local economic advantages of having the installation of equipment be done by third party installers. Also, as part of this program, the BPU staff will consider a structure that ensures available resources are fairly distributed amongst customer classes and that the most cost effective efforts at reducing energy consumption are given the appropriate resources. If rate-payers or the State are paying for this program, then the projects that are most cost effective at achieving energy savings need to receive significant resources in order to meet the Governor's 2020 energy consumption goals.

The BPU staff will ensure that the State's energy efficiency programs are performance based and sufficiently coordinated with the other action items in this plan including but not limited to demand response efforts and renewable energy programs. This will include identifying the proper method to provide energy efficiency programs in areas that are not served by one of the four electric or natural gas utilities, including areas that are served by municipal electric utilities not regulated by the BPU. Also, the State and the utilities will engage the heating oil and propane providers to determine their role in these energy

efficiency programs, including program funding and integration with the utility administered programs.

The transition of this program will begin in 2009, and the utilities will develop their energy efficiency plan as part of their planning effort described in Goal 4.

Significant resources will be required to meet the Governor's 2020 energy consumption goals. To pay for this effort, the BPU staff will work with the Rate Counsel, the utilities and other stakeholders to identify the appropriate financial structure to provide cost recovery of the utilities' energy efficiency investments. Funding sources to be considered for this program will include: a reallocation of existing Clean Energy Program funds, upfront capital costs provided by private investors and/or electric and gas utilities, auction revenues from the Regional Greenhouse Gas Initiative, electric and gas rates, and potential revenues from the inclusion of energy efficiency and conservation in regional capacity markets. Most likely, this effort will require a combination of these funding sources to implement a comprehensive, integrated effort to meet the State's 2020 energy consumption goals.

Also, a new law signed by Governor Corzine in January 2008 will allow electric and gas utility rate structures that can reduce or eliminate the disincentives for utilities to pursue energy efficiency and conservation efforts. Currently, the rates at which utilities sell a commodity such as electricity or natural gas are designed to produce revenues to cover the wholesale cost of the commodity, the fixed cost of infrastructure to deliver the commodity, and a return on investment. Reduced consumption reduces revenues, creating a disincentive for utilities to work aggressively toward energy efficiency and conservation. Utility rates could be designed in any number of ways to eliminate that disincentive. However, aligning the ratepayer value of cost-effective efficiency with utility financial goals is necessary to leverage the market-place resources to help fund effective energy efficiency investments.

As of September 2007, 10 states have adopted natural gas rate designs intended to eliminate disincentives for utilities to pursue efficiency and conservation. These states include Delaware, Maryland, Ohio, Indiana, Missouri, Arkansas, Utah, California, Oregon and Washington. In addition, several other states are considering similar programs, including New York, Virginia, Tennessee, Illinois, Wisconsin, Colorado, and Arizona.

In New Jersey, the BPU approved a pilot program of this type in October 2006, known as the Conservation Incentive Program, for New Jersey Natural Gas Company and South Jersey Gas Company. The pilot program creates an incentive for the utilities to achieve sustainable reductions in natural gas consumption; success in that effort is rewarded by incentives that are shared between the utility and the customers.

The BPU staff and Governor's Office staff will continue to work with the Northeast Energy Efficiency Partnership (NEEP), to finalize the implementation strategies of this action item. NEEP will finish its examination of the current programs that are being

implemented by the State, and propose actions that should be considered in addition to the actions outlined in the Energy Master Plan.

IMPACTS: The goal of this program will be to identify and implement cost-effective energy efficiency measures that could achieve over 15,000 GWh of electricity savings and almost 75 trillion BTUs of total heating savings by 2020.

ACTION ITEM 2: Work with the Legislature to authorize the development of statewide building codes to result in new construction being at least 30% more energy efficient than current state code by July 2009 and develop a strategy to achieve net zero carbon emitting buildings.

It is generally simpler and cheaper to incorporate energy efficiency measures into a building at the time of construction or renovation than it is to retrofit an existing building. The payback period for the investment in greater efficiency is anticipated to be less than seven years. The quick payback suggests that a statewide building code setting higher energy efficiency for new buildings will be cost-effective.

Pending State legislation (S702) would authorize the development of such a code. In order to have the code in place by the end of 2009, legislation would need to be enacted by January 2009. The State will also support energy-efficient new homes by offering financial assistance to low and moderate income families for the down payment on a new energy-efficient home, through reallocation of existing monies in the Clean Energy Program.

In addition, the DCA, DEP and BPU staffs will work together to develop a statewide strategy to achieve net zero carbon emitting buildings for all new and existing buildings including both homes and commercial and industrial buildings. They will develop this strategy, which will include regulatory, statutory, and other changes that will be necessary in order to achieve this goal for new construction and existing buildings. Working together with stakeholders they will also identify a reasonable period of time along with milestones that will put the state on this path. This will include annual percentage goals to achieve net zero carbon buildings within the established timeframe. The plan will be submitted to the State Energy Council by the end of 2009.

Upon the release of this plan, the Clean Energy Program will begin to realign its incentive programs for new and existing buildings including both homes and commercial and industrial buildings to assist in achieving this goal.

IMPACTS: When fully implemented, this legislation is estimated to achieve electricity savings of nearly 1,000 GWh and total heating savings of nearly 20 trillion BTUs per year by 2020.

ACTION ITEM 3: Work with the Legislature to set minimum energy efficiency standards for new appliances and other types of equipment currently not covered by existing standards by 2009.

Pending State legislation (A1763, S1253) would allow New Jersey to set minimum energy efficiency standards for certain types of equipment including:

- Bottle-type water dispensers.
- Commercial hot food holding cabinets.
- Natural gas and propane fired residential furnaces.

In addition, the BPU staff working with the DCA staff will conduct an annual review of new appliance equipment and appliance energy efficiency improvements to determine whether new energy efficiency standards will be necessary. This will help New Jersey stay at the forefront of energy efficiency in its homes.

IMPACTS: While setting minimum energy efficiency standards will increase the cost of the products, the payback period will be less than three years. Savings under these initial standards are projected to be over $115 million to businesses and consumers in 2020. Additionally, the State will seek waivers from federal standards to mandate stricter minimum-efficiency standards.

When fully implemented, this legislation and other recently approved standards are estimated to achieve more than 2,500 GWh of electricity savings and total heating savings of more than 6 trillion BTUs by 2020.

ACTION ITEM 4: Increase education and outreach in the public and private sectors.

Working with organizations like the League of Municipalities, Conference of Mayors, New Jersey Business and Industry Association, and the New Jersey Utilities Association, the BPU's Office of Business Energy Ombudsperson will select up to ten industry sectors to create Best Practice Manuals featuring recommendations for energy efficiency improvements.

The first manual to be generated will be for local governments and will be provided to them by the end of 2008. This will help the local governments begin work at the municipal level, and can begin to engage their residents on the need for increased energy efficiency, use of clean energy and reduced peak demand. The involvement of the local governments will be a critical component to changing the way the businesses and residents in this State think about energy use.

Also, localized workshops and one-on-one consultations through the Office of the Business Energy Ombudsperson will be utilized in the areas of energy efficiency, on-site generation (including renewable sources), demand response and energy supply purchase.

Additionally, the BPU will create a partnership of representatives from utilities, businesses, environment, academia, county/municipal/state governments, K-12 educators,

and consumer advocacy groups. This group will review existing education efforts in the public and private sectors and recommend an ongoing mix of education programs and resources to help New Jersey achieve its energy efficiency goals.

In addition to increasing the public awareness and knowledge of energy efficiency, the State will work with the utilities, colleges, universities, trade schools and unions, and professional associations to identify workforce needs of professional and skilled labor to deliver energy efficiency solutions to 300,000 buildings each year and what will be needed to recruit, train and certify this work force across the state.

IMPACTS: The development of Best Practice Manuals will allow entire industry sectors to reduce their energy costs. Coupled with the other Actions Steps in this Goal, businesses will be able to reduce their energy usage in a cost-effective manner and thus become more cost competitive and be able to remain in New Jersey.

Every citizen of the State needs to know the importance of the energy decisions that are made and how they impact the State's economy and environment. Improving the information that is provided to students and adults should allow for greater utilization of the energy efficiency opportunities that each person can utilize to save on their energy costs and reduce their carbon footprint. Involvement of local governments in this effort will help begin this enormous task of reaching all of the commercial, industrial and residential consumers in the State.

GOAL 2: Reduce peak demand for electricity by 5,700 MW by 2020.

Unabated growth in our peak demand for electricity, during a few hours daily, drives the need for expensive expansions of our electricity infrastructure to meet that peak demand reliably. That need, in turn, increases our costs for the necessary capacity reserves. By far, the most cost-effective way to preserve our electricity reliability and lower capacity costs is to reduce peak demand.

To meet peak demand, additional transmission lines, and electricity generators are needed to ensure reliability. However, this additional reliance on new transmission lines and peak generators significantly increases up energy costs, as indicated in Figure 4. If the State is successful in meeting its goal, the total cost savings to consumers in their electricity rates could be great compared to the "business as usual" scenario.

To achieve the goal, it is estimated that 900 MW of peak demand can be reduced through specific peak demand initiatives. An additional 4,800 MW of peak demand can be reduced through the energy efficiency and cogeneration action items described in this document. The State's work with the NEEP, and the electric and gas utilities will examine how energy efficiency efforts can best be coordinated with programs that provide demand response.

Therefore, the following demand response action items are proposed to effectively reduce peak demand by 900 MW by 2020:

- Expand incentives for participation in regional demand response programs.
- Involve electric utilities in developing and implementing demand response programs.
- Target all commercial and industrial customers with a peak demand of 500 kW or greater for reduction in peak demand and continue to develop incentives that achieve significant peak demand saving.
- Pilot different technologies and rate structures for residential customers and customers with a demand of less than 500 kW.
- Monitor the results of all demand response initiatives through 2012 and implement the most effective mix of action steps to achieve a total peak demand reduction of 5,700 MW by 2020.

The BPU has also approved two programs that will attempt to reduce peak demand. The first program involves an auction design that will allow for curtailment service providers and other entities to commit to peak demand reductions. The other program involves the utilities where they will develop programs targeted at specific peak demand reductions in their territory. These programs will be helpful to staff at determining what entities can meet the State's peak demand goals at the lowest cost to the ratepayers.

Implementing the energy efficiency actions under Goal 1 will contribute to reducing peak demand as it reduces energy consumption at all times. Fostering the development of clean and efficient on-site cogeneration capacity, as discussed under Goal 4, will reduce overall demand on electricity from the grid, and therefore will help to reduce peak demands on the grid as well.

Figure 14 shows the estimated breakdown of the peak load reductions that could be achieved through the implementation of these action items.

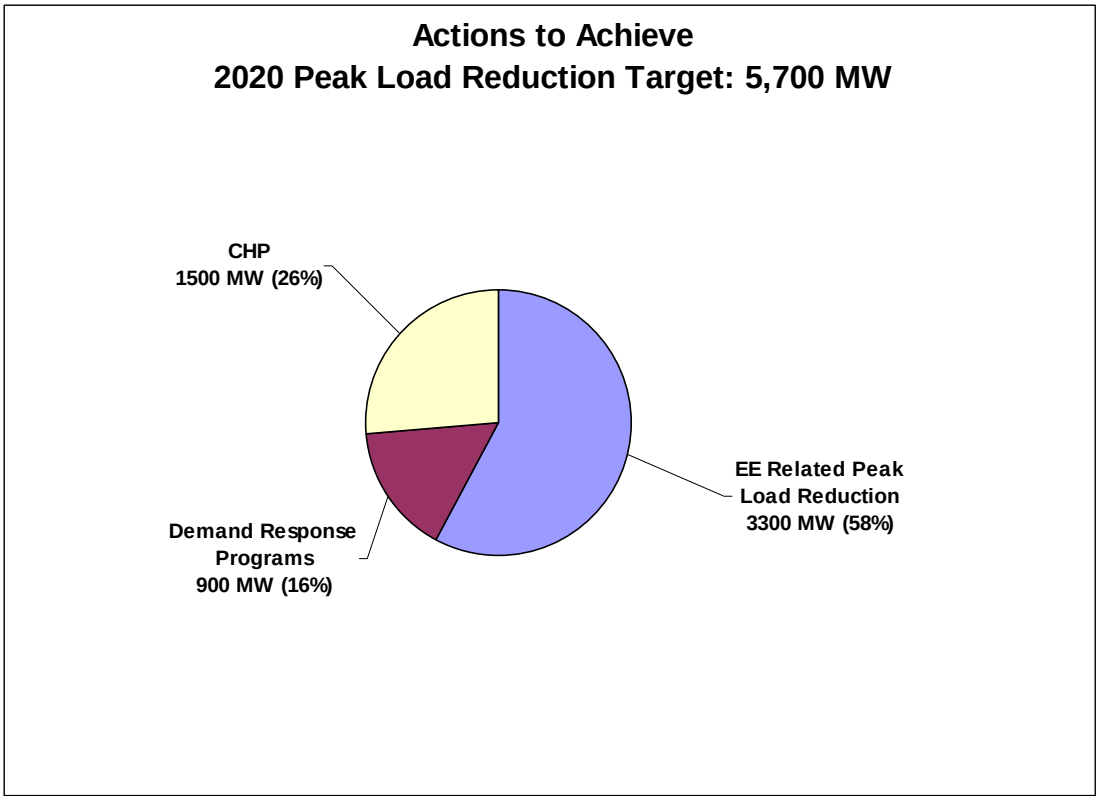

Figure 14: Actions to Achieve Peak Load Reduction Target. Reducing peak load requires a combination of strategies, including energy efficiency, combined heat and power (CHP), and demand response programs. Demand response strategies, discussed in this section, will achieve 900 MW of peak load reduction, or nearly 16% of our peak load target.

ACTION ITEM 1: Expand incentives for participation in regional demand response programs.

Currently, PJM offers demand response programs that pay certain customers to reduce their load during peak demand periods. For example, PJM allows a commitment to reduce demand at peak times to be considered a capacity resource, which can earn capacity payments under PJM's Reliability Pricing Model.

Therefore, the Governor's Office, the BPU, and the BPU staff will work closely with PJM and stakeholders to maximize demand response incentives through PJM-administered markets. In addition, demand response could be encouraged further through State incentives added to the revenues available in PJM markets.

IMPACTS: Demand response incentives from PJM will reduce the peak demand for electricity across the PJM territory and result in a reduced need for generation from high cost generators such as peaking plants.

ACTION ITEM 2: Involve electric utilities in developing and implementing demand response programs.

Currently, the BPU is working with the electric utilities and other industry stakeholders on two approaches to load management; one being utility-administered and the other being market-based. These programs will be evaluated to determine which incentives are most effective, and which entities are most efficient at getting the peak demand savings that are articulated in this plan.

The following measures should be considered by the BPU to encourage expanded participation in demand response programs:

- Changes to the current rate structures such as "real-time electricity pricing," which would provide for increased financial incentives to large commercial and industrial customers to reduce their peak demand.
- Electric utility procurement of demand-side resources as a complement to the BGS auction, so that the effect of a known quantity of demand response on peak electricity prices can be reflected in the BGS price.
- Electric utility programs for direct load control and other measures tailored to each utility's local needs.

IMPACTS: Specific programs will be designed and evaluated so that any cost to ratepayers will be cost-effective. Providing incentives for demand response to all consumers will reduce peak demand, thereby reducing overall electricity prices by reducing demand for high priced electricity generators to operate during peak time, which will benefit all ratepayers. In addition, reducing peak demand also has a positive environmental impact by avoiding the need to run peaking units and their associated air pollutants.

ACTION ITEM 3: Target all commercial and industrial customers with a peak demand of 500 kW or greater for reduction in peak demand and continue to develop incentives that achieve significant peak demand saving.

The commercial and industrial electricity users in New Jersey, consume about 64% of the State's total electricity consumption, and contribute substantially to the peak demand (see Figure 15). These large energy consumers provide the state with a tremendous opportunity to reduce peak electricity usage, and make the necessary investments in energy efficiency.

Therefore, the BPU Office of the Energy Ombudsperson will be responsible for targeting commercial and industrial customers, to educate and inform them about peak demand and energy consumption reduction incentives provided by PJM and the State.

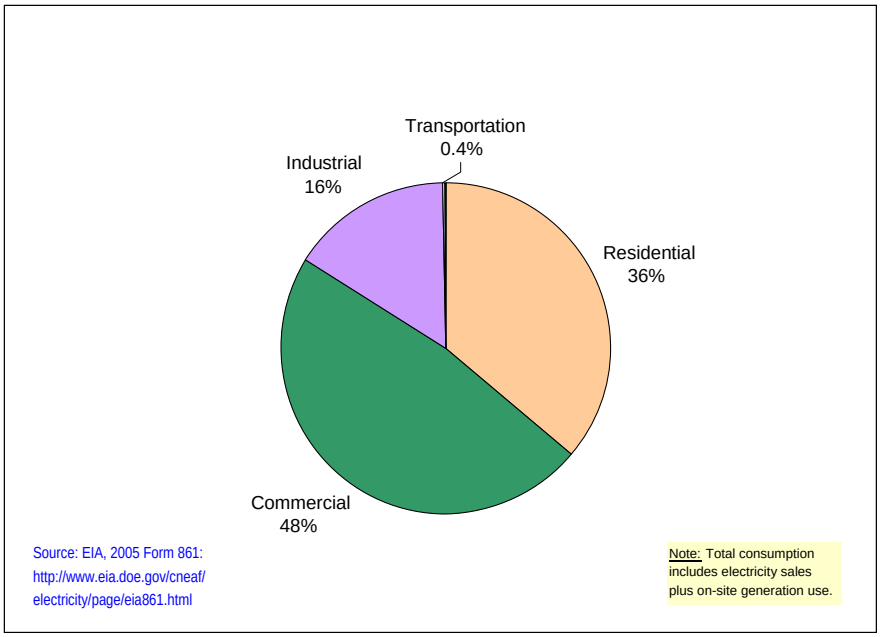

Figure 15: New Jersey End-Use Electricity Consumption by Sector (83,120 GWh - 2005)

This office would be responsible for developing a best practices guide as well as a listing of State registered companies that can install and operate demand response equipment at these businesses. All commercial and industrial customers with a peak demand of 500 kW or greater will be targeted by this office by 2012. To support this office, additional resources will most likely be necessary. Therefore, the BPU will develop a resource analysis within three months of the release of the EMP, to the Governor's office indicating the amount of resources necessary to make this effort a success.

In addition, over the next 6 months, the BPU staff will develop a report for outlining the demand response best practices in other states, and regions to determine if there are additional incentives that can be made available to these customers to encourage their reduction in peak demand.

The vast majority of New Jersey's electricity customers receive their electricity at a fixed price, set through the yearly BGS auction. Unlike in the cell phone industry, where customers can make informed decisions about when to make calls based on price variations, most electricity customers pay a fixed price which provides them with no information that would lead them to use less electricity at times of peak demand. Currently, in New Jersey, customers with a demand of 1000 kW and higher face real-time electricity prices.

Therefore, as part of this consideration, the BPU staff will focus on the technologies and rate structures that would be most effective at achieving this goal while mitigating its impact on customers that may be adversely impacted due to the inability to reduce their peak demand. They will look at the demand response efforts of the customers currently with real time pricing, examples of what has been done in other states, and the results of their two BPU sponsored demand response programs involving the electric utilities and

curtailment service providers, to determine the best set of incentives and action items to achieve the peak demand reduction targets.

The BPU staff will annually evaluate the State, regional and national best practices that achieve peak demand reduction to determine if there are other opportunities and policies that should be enacted in order to achieve this goal.

IMPACTS: Together with the incentives that are provided from PJM, and possibly the State, the Office of the Business Energy Ombudsperson will aggressively target large commercial and industrial customers to achieve the behavioral changes that are necessary to reduce peak demand.

ACTION ITEM 4: Pilot different technologies and rate structures to determine the best way to achieve peak demand reductions for residential customers and all customers with a peak demand below 500 kW.

It is currently uncertain whether the infrastructure needed to provide real-time price information to small customers will eventually prove cost-effective and reliable, or whether smaller users will have the capacity to respond fully to pricing variations and be able to pay for the up front capital costs of installing the necessary equipment. Therefore, the BPU staff will set up a series of pilot programs to determine which technologies and rate structures will be most effective at achieving the State's demand response goals. These pilots will help determine how customer behavior changes with different:

- Rate structures
- Communication network,
- End user technologies such as advanced metering infrastructure (AMI).

This effort will help the State better understand how smaller electricity customers, the residential sector in particular, make decisions about how they manage their electricity consumption.

Technologies such as smart meters and AMI will be part of these evaluations. Smart meters and AMI are increasingly being used and tested as a means for customers to manage and reduce their energy costs. They have significant potential to help New Jersey meet its demand response goals. However, since it is still an early stage technology without a long history, New Jersey will move forward in a manner that allows for testing and evaluation in order to gather data before moving forward with a state wide effort. These technologies will also need to be evaluated based on their interaction with whichever rate structure is determined to be most effective.

As part of the BPU's piloting of rate structures, one of the rate structures that must be considered is "peak" and "off-peak" pricing. This would work similar to cell phone rates, where there is a peak time and an off peak time for electricity usage. This would provide clear market signals to cut load during peak times, while not inundating the consumer with too much information. Also, an expansion of the "inverted tariff" pricing for

customers should also be considered. An "inverted tariff" would charge consumers a higher rate for exceeding an electricity usage amount, or for using electricity during a specific time.

To develop these pilots, the BPU staff will work with the Rate Counsel, the electric utilities and consumer groups to design these pilot structures. Regional approaches to the piloting of these technologies may be necessary, and staff will look to other states for examples of such pilots. These will need to move forward as quickly as possible in order to allow for a complete dialogue to take place concerning the modernization of the grid, as described in Goal 4 of this plan.

IMPACTS: There is not expected to be an economic impact for the rate design as they could be designed to be revenue neutral. The impact of the pilot projects to rate payers will be minimized, but this impact cannot be quantified until a program and cost recovery method are identified. However, the State will pursue all possible finance options to pay for this pilot without impacting tax payers or rate payers such as securing federal grants or private investment dollars.

ACTION ITEM 5: Monitor the results of all demand response, energy efficiency, and conservation initiatives through 2012 and implement the most effective mix of action steps to achieve a total peak demand reduction of 5700 MW by 2020.

The demand response initiatives in this Energy Master Plan are experimental and largely untested on a substantial scale. Therefore, the State will continually assess the results of these programs, and their interaction with energy efficiency and conservation efforts, and determine which programs bring the maximum results at the least cost to consumers.

To achieve the total reduction in peak demand of 5,700 MW, the State will engage in an ongoing assessment of the initiatives outlined in this Plan, and utilize a mix of the best performing programs to achieve the results through 2020. This action step will be revised for the annual Energy Master Plan performance evaluation in the year 2010.

IMPACTS: Reducing peak demand by 5700 MW will greatly assist in achieving a reliable electricity infrastructure at a more reasonable price than the business as usual scenario. Eliminating the need to either generate or import this amount of energy will significantly reduce greenhouse gas emissions and assist in meeting the targets specified in the Global Warming Response Act.

GOAL 3: Strive to surpass the current RPS goals with a goal of achieving 30% of the State's electricity needs from renewable sources by 2020.

Renewable energy and other alternative energy technologies, provide New Jersey with an opportunity to meet many of its energy challenges. These technologies provide electricity using resources that are plentiful in the State, and either emit zero or much less greenhouse gas emissions than their fossil fuel counterparts. However, the capital costs to install these technologies are typically much more expensive than fossil fueled based generation. Despite the rising costs of fossil fuels, and the declining costs of renewable energy technologies, there is still a substantial, yet closing, price gap between these technologies, and the costs of continuing to rely on the current system is not economically or environmentally sustainable. Therefore, New Jersey must commit to a significant and widescale implementation of renewable energy technologies that make access to these technologies and their benefits available to all energy consumers in the State.

In April 2006, the BPU approved an aggressive expansion of the Renewable Portfolio Standard (RPS) for the State. These standards now require the electricity retailers to supply an increasing portion of the electricity they deliver from renewable sources, with renewable sources providing a total of 22.5% of electricity sales by 2020. Figure 16 shows the State's current RPS requirements, and the additional work that is necessary to meet the current 2020 goals.

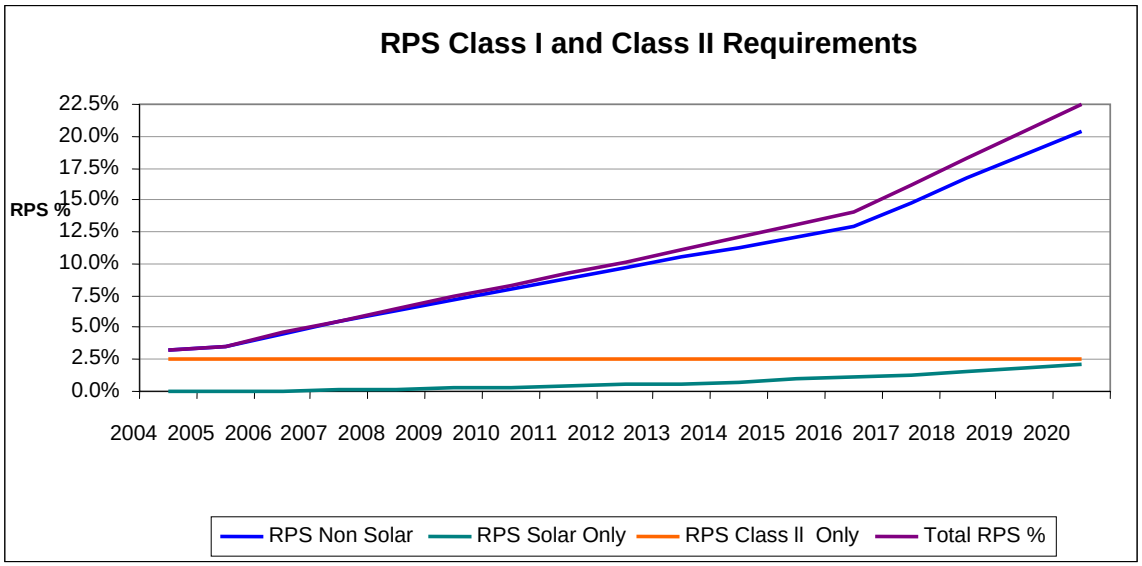

Figure 16: New Jersey's RPS requirements through 2020.

There are three specific standards: one for "Class I" renewable energy, one for solar energy, and one for "Class II" renewable energy. By 2020, 20% of electricity delivered to New Jersey customers must be "Class I" renewable energy, including electricity generation from solar energy, wind energy, wave or tidal action, geothermal energy, landfill gas, anaerobic digestion, fuel cells using renewable fuels, and other forms of sustainable biomass. Solar electric generation can be used to help meet the "Class I" RPS, but there is also a separate solar RPS that specifically requires 2.12% of electricity delivered by 2020 to be generated from solar energy. By 2020, 2.5% must be "Class II" renewable energy, including electricity generated by hydropower facilities no greater than 30 MW, and resource-recovery facilities approved by the DEP and located in New Jersey.

While the goal of 22.5% by 2020 is aggressive and strong compared to other states, New Jersey can do more to develop an energy infrastructure that is less carbon intensive and less reliant on the volatility of the current energy markets. In fact, the State can surpass the goals of this RPS by implementing the following action items:

- Change the solar energy goals from a percentage of 2.12% to a goal of 2,120 GWh by 2020.
- Develop New Jersey's wind energy resources, including at least 1000 MW of offshore wind by the end of 2012, and at least 3000 MW of offshore wind and up to 200 MW of onshore wind by 2020.
- Develop 900 MW of biofuels and biomass as part of the State's 2020 RPS.
- Increase support for other renewable energy technologies.
- Increase the RPS for the years 2021 to 2025.

Together, it is estimated that these renewable energy goals will provide more than 20,000 GWh of clean and renewable electricity generation to the State's consumers by 2020. Based on projected reductions in energy consumption and the cogeneration goals, listed

under Goal 1 and Goal 4 of this plan respectively, this total demand for electricity supply in the State may be as low as 68,300 GWh in 2020. This would result in renewable energy generation supplying approximately 30% of the State's overall electricity demand.

Setting New Jersey on a course to surpass the current RPS goals reaffirms the State's role as a national leader on renewable energy and establishes the State as a regional center for an emerging clean energy economy. For this reason, policies that encourage the development of New Jersey based renewable energy generation must be considered in all State renewable energy activities, including procurement and policy development. This action will not only ensure that New Jersey consumers have direct access to this renewable energy generation, but will also develop "green collar" jobs and establish a significant clean energy industry in the State.

This renewable energy goal of 30% by 2020 will be considered as part of the BPU staff's work to extend the RPS to 2025, and approve this extension by January 1, 2010. This will ensure that the RPS is always set at least ten years forward and that a thorough and proper stakeholder process takes place to provide input into the RPS.

ACTION ITEM 1: Change the solar energy goals from a percentage of 2.12% to a goal of 2,120 GWh by 2020.

Since 2001, New Jersey has established itself as a national and international leader in the development of solar energy and has constructed more than 60 MW of solar projects in the state. Originally, these projects were constructed using rebates from the Clean Energy Program, which totaled more than $200 million.

Since the inception of the Clean Energy Programs solar energy rebate program, it has been clear that the initial model of relying heavily on upfront rebates would not be financially sustainable to achieve New Jersey's long-term goals. The BPU has been decreasing the rebate level over time, from 70 percent of the installed cost of the solar system to 50 percent. In December 2007, the BPU approved a phase-out of rebates as an incentive for installing solar, and a transition toward incentives based on the market value of Solar Renewable Energy Certificates (SRECs) earned by generating electricity from solar energy. Electricity suppliers satisfy their obligations under the solar RPS using SRECs for compliance, or by paying a Solar Alternative Compliance Payment.

Sustained, orderly growth in New Jersey's solar industry depends on an environment that supports investor confidence that will ease financing of solar installations. This is the reason why in July 2008, the Board approved a "solar financing" program that would help to stabilize the solar market in this time of transition. Through this program, the electric utilities will enter into long term SREC contracts for 10 to 15 year periods and sell these SRECs to electricity suppliers to meet their solar RPS requirements. This program will ensure that solar energy projects continue to be developed while the market determines the long-term price for SRECs. Once the markets have firmly been established the transition away from unsustainable rebates will ensure an environment that supports investor confidence in solar energy installations in New Jersey.

Continuing with this commitment to solar energy development in the State, the BPU will transition the solar energy goals from a percentage (2.12% by 2020) to a goal of 2,120 GWh by 2020. Depending on future efficiencies of solar panels, it is estimated that this total would need approximately 1800 MW of solar energy capacity installed by 2020.

The original goal of 2.12% of the State's electricity consumption coming from solar energy by 2020 would have worked against the energy reduction goal of 20% by 2020. This reduction in overall energy consumption would have suppressed solar energy development between now and 2020. In the "business as usual" scenario, more than 2,120 GWh (approximately 1800 MW) of solar energy would have been constructed compared to only 1,347 GWh (approximately 1200 MW) of solar energy being constructed in 2020 for the "alternative" scenario. Therefore, a commitment to the 2,120 GWh goal could result in as much as 600 MW and more than 700 GWh of additional solar energy in New Jersey by the year 2020.

Remaining consistent with the State's desire to provide clear signals to investors and the solar energy community, setting this goal will continue the State's role as a national leader in the development of solar energy and provide a more stable environment for which to support these projects. As part of this revised goal, the BPU will work to make the necessary rule changes that will appropriately distribute SREC requirements to the load serving entities (LSE's).

Further help for the development of solar energy, will come from the availability of community-based solar programs, which would allow residential and small commercial customers to participate in the solar market through participation in larger, lower- cost community-based systems and by grid supply projects. This will provide for increased distributed generation, which places less stress on the transmission system, while providing communities with increased control over their local energy portfolio. The BPU staff will conduct a stakeholder process to identify if any statutory changes are needed or if this can be accomplished by modifying the RPS and net metering. A report summarizing the findings from the stakeholder process will be submitted to the Governor's office by the end of 2008 with a goal of having the program in place by the end of 2009.

IMPACTS: The price of the SRECs is expected to create the financial environment necessary to substantially grow the solar industry and solar energy installations between now and 2020. This action item will result in 2,120 GWh of electricity demand being served by solar energy by 2020.

ACTION ITEM 2: Develop New Jersey's wind energy resources, with at least 1000 MW of offshore wind stalled by 2012, and at least 3000 MW of offshore wind and up to 200 MW of onshore wind by 2020.

Unlike solar energy, wind energy resources are limited to specific areas of the state. At present time, off-shore wind energy offers tremendous potential, while on-shore wind energy resources appear to be limited given the current available technologies.

Therefore, the State will move forward with planning efforts to support 200 MW of on-shore and 3000 MW of off-shore wind energy, which together could provide approximately 9,500 GWh of electricity, effectively supplying the State with 13% of its total energy needs in the 2020 "alternative" scenario.

Through multi-agency coordination, the State is gathering the necessary environmental and economic information needed to make an informed and thoughtful decision on the process and locations that can support this offshore wind development. Several closely coordinated steps were undertaken in 2007 to determine the potential for an offshore wind project in New Jersey.

First, the DEP began an ecological baseline study of the State's ocean natural resources, designed to inform the development of an offshore wind project. No construction will begin until the results of the environmental analysis are completed, which is expected to take place during the summer of 2009.

Concurrently, the New Jersey Commerce Commission undertook an assessment of the potential costs and benefits of off-shore wind turbines to New Jersey's economy, including tourism that was released earlier this year. The report concluded that potential tourism impacts from an offshore wind facility are greatly reduced as the turbines distance from the shoreline increases. It also concluded that any tourism impacts would be temporary and would decline quickly. This information will be very helpful to the State as it plans future offshore wind development.

Finally, the BPU has announced that Garden State Offshore Energy has been selected to develop a 350 MW offshore wind farm, in response to the BPU's competitive solicitation. This offshore wind generation program will produce about 1,000 GWh per year—over 1% of the State's annual electricity consumption. Five responses were submitted in response to the solicitation, and the State will continue to engage the other 4 applicants and all other interested wind developers to push forward and achieve 1000 MW of offshore wind development by the end of 2012. All projects will be coordinated with the DEP ecological baseline study.

Building from these efforts over the past two years, the Governor's Office, the DEP and the BPU will work together to put in place a series of policies that create increased certainty in the regulatory environment that will encourage the free-markets to construct offshore wind projects in environmentally approved areas. To achieve this goal the Governor will establish an Offshore Wind Planning Group that will consist of the DEP, BPU, the Rate Counsel, and public members to develop the necessary plan to guide the development of offshore wind. Some of the issues to be considered as part of this plan will include:

- Impacts to the environment using the DEP ecological baseline study and other environmental studies and study areas if necessary.
- Impacts to the local economies using the recent Commerce report study and other impact studies and areas if necessary.
- Various financing models to support the development of offshore wind.

- Coordination with PJM on interconnection and grid integration issues.
- Creation of a more certain regulatory environment for offshore wind by entering into agreements with entities such as Minerals Management Service or other regulatory entities.
- Coordination of wind energy incentives and efforts to support wind energy development with other states including Delaware and Maryland.

This plan will include both short-term and long-term actions that make 3,000 MW of offshore wind a reality. Short-term solutions will include regulatory or statutory changes that allow for innovative financing designs that will make offshore wind a reality given today's markets. Long-term strategies will include State sponsored actions that support the development and commercialization of wind technologies that reduce the cost of installing wind turbines. For example, investments that decrease the cost of wind manufacturing, and investments in research, development and commercialization of new wind technologies will be supportive of this effort.

While the prospects for onshore wind are not nearly as great as those of offshore wind, New Jersey has installed 11 onshore wind turbines since 2001. New Jersey's Clean Energy Program provides rebates for wind energy systems less than 1 MW in size, while the Renewable Energy Project Grants and Finance Program provides subsidies for systems larger than 1 MW.

In order to responsibly encourage the development of onshore wind turbines the State will:

- Shift from a rebate-based system rated on capacity to a program based on performance.
- Modify the Renewable Energy Project Grants and Finance Program to reflect the needs of large-scale wind projects.
- Publish a guidebook for small wind energy systems.

The BPU staff will continue to monitor the progress that is being made with onshore wind energy generating technologies. As technology breakthroughs occur, the BPU will act quickly to adjust its policies to ensure the aggressive development of wind energy, as part of the State's energy portfolio.

IMPACTS: Wind power has great potential to reduce the State's reliance on fossil fueled based electricity generation. The studies by the Commerce Commission and the DEP will determine ecological and economic impacts that offshore wind energy projects may have on the region. However, additional areas may need to be studied as the State learns more about its offshore wind potential. It is estimated that this action item will yield more than 9,500 GWh of electricity in 2020.

ACTION ITEM 3: Develop 900 MW of biofuels and biomass as part of the State's 2020 RPS.

New Jersey has tremendous biomass energy potential. This potential was analyzed by the Rutgers New Jersey Agricultural Experiment Station, in its "Assessment of Biomass Energy Potential in New Jersey." This report yielded the following major findings:

- New Jersey produces an estimated 8.2 million dry tons (MDT) of biomass annually.
- Approximately 5.4 MDT of New Jersey's biomass could ultimately be available to produce bioenergy.
- Almost 75% of New Jersey's biomass resources are produced directly by the State's population, a majority of which in solid waste. The state's five municipal solid waste incinerators currently convert about 17% of that solid waste into energy.
- Agriculture and forestry management account for the majority of the remaining amount.
- New Jersey's estimated practically recoverable biomass resource of 5.5 MDT could deliver up to 1,124 MW of power or 311 million gallons of gasoline equivalent if appropriate technologies and infrastructure were in place.
- The large proportion of waste-based biomass, suggests that New Jersey pursue the expansion of waste to energy technologies, other than incineration.

Based upon the Rutgers findings, the BPU will, working with the DEP, examine what changes they can make in the current RPS to support the development of 900 MW of biofuel based electricity generation by 2020. The development of biofuels for heating oil offers an opportunity to serve as a transitional fuel from oil to a cleaner and more sustainable source of energy.

Biofuel and biomass technologies that can be harvested in a sustainable manner without compromising food production should be supported with a series of action items by the BPU. Incentives to be considered by the State will include a "carve out" similar to solar energy or other financial structures that encourage the development of these technologies.

Currently, biofuels are being used to heat approximately 7,000 customers' homes in South Jersey. They are using 5% biodiesel blended with 95% petroleum-based heating oil for space heating purposes. If this blend were to be adopted by the State, based on 2020 projected consumption, it would require approximately 16.8 million gallons of biodiesel by 2020 and result in over 2.33 trillion BTUs of space heating savings. This blend should be expanded to cover the entire State, and the Administration will work to create a 2% biodiesel standard for all sales of space heating oil in New Jersey beginning 2015 and increasing to 5% by 2020.

Biomass energy potential, such as waste to energy, will also be considered as part of this effort. New Jersey has one of the highest per capita incomes in the United States, and one of the highest rates of trash generated per person. New Jersey residents generate 6.7 pounds of trash per person per day, nearly 50% higher than the national average. This offers a significant opportunity to pursue conversion of trash into energy and fuel

products. Conversion of this waste into energy will also reduce the need for future landfill development, and consequently reduce the amount of methane, a greenhouse gas, that is emitted from these landfills. Therefore, as part of the BPU's analysis they will consider incentives, including changes to the RPS, that can be put in place to support waste to energy technologies that are more sensitive to the environment than the current methods. However, due to their emissions and inherent inefficiencies, incineration technologies will not be supported as part of this effort.

The BPU staff, working with the DEP staff and the State Universities will evaluate the following proposals to stimulate the growth of biofuels in New Jersey and develop a minimum of 900 MW of electric production capacity using bio-energy resources other than incineration and 16.8 million gallons of biodiesel for heating purposes by 2020:

- Identify and alleviate regulatory concerns across permitting agencies to streamline and simplify approval processes.
- Consider a societal benefits charge on petroleum based fuels to support bio-energy incentive programs.
- Establish bio-energy enterprise zones around concentrations of feedstocks where bio-energy can be strategically utilized.
- Develop a consumer-based biofuels incentive program.
- Consider modifying the current RPS to support 900 MW of biofuels and biomass other than incineration by 2020.

IMPACTS: New Jersey has considerable biofuel and biomass resources that will be analyzed to determine the economic and environmental impacts of their conversion into energy. These technologies could provide the State with a fuel source that is produced locally and emits fewer emissions. This action item is estimated to provide more than 6,700 GWh of electricity generation and 2.33 trillion BTUs for heating in 2020.

ACTION ITEM 4: Increase support of other renewable energy technologies.

In addition to the State's aggressive solar, wind and biofuels goals, policies need to be put in place that encourage the development of other renewable energy technologies such as low head hydro and other new technologies that may emerge such as tidal power. In order to support these technologies, the BPU will consider an RPS "carve out" model for new and emerging technologies of up to 50 MW a year through 2020. Any alternative compliance payment collected for any new and emerging technologies development that did not happen in a year, will be used to fund the research efforts of the Energy Institute described in greater detail as part of Goal 5 of this plan.

IMPACTS: Through revisions to the RPS, new and emerging renewable technologies will generate up to 50 MW a year through 2020. This will provide an incentive for the development of next generation renewable technologies.

ACTION ITEM 5: Increase the Renewable Portfolio Standard for the years 2021 to 2025.

The current RPS maintains the 2020 requirements to any future year. It is appropriate to begin the process of evaluating the appropriateness of increasing the Standard for the years 2021 to 2025. This evaluation will be undertaken by the BPU and will consider issues such as grid reliability, the feasibility of electricity storage using plug-in hybrids or other storage technologies, the prospects of hydrogen as a transportation fuel, the cost and environmental impacts of additional offshore wind possibly coupled with wave technology, and the projected costs of solar technology. The BPU staff will work to finalize this 2025 RPS by January 1, 2010 to ensure that the RPS is always set at least ten years out.

IMPACTS: Increasing the RPS for the years 2021 to 2025 will send a clear signal to investors, renewable energy companies and the utilities, that renewable energy technologies will continue to make up a large portion of New Jersey's energy future. The impacts and capacity of the electricity grid will be part of this evaluation to determine which, if any, infrastructure improvements are necessary to support an aggressive renewable energy commitment through 2025.

GOAL 4: Develop a 21st century energy infrastructure that supports the goals and action items of the Energy Master Plan, ensures the reliability of the system, and makes available additional tools to consumers to manage their energy consumption.

Together, the energy efficiency, reduced peak demand and renewable energy goals will effectively reduce consumers overall energy consumption while relying on an energy supply that has much lower carbon dioxide emissions from today. However, many of these renewable energy supplies provide an intermittent supply of electricity. Consequently, the homes and businesses that use these technologies will still be dependent on the electricity grid to ensure reliability. Therefore, the State's efforts to meet the greenhouse gas targets for 2020 and the need to create a reliable supply of competitively priced electricity will largely depend on the ability of the energy infrastructure, including transmission lines and pipelines, to support the various efforts in this plan.

New generation may also be required to ensure the reliability of the system and balance energy supply with energy demand. Several factors could result in this need such as the retirement of existing generation facilities, and unexpected rise in energy consumption, or the need for a different type of generation to compliment the renewable energy supply that is being developed. Regardless of the reason for this need to balance supply and demand, new development of generation capacity needs to provide electricity at a lower cost per megawatt-hour and with lower carbon dioxide emissions than current generators.

Reduced reliability of the energy system will result in people not being able to find fuel to heat their homes, or electricity to light their homes and run their businesses.

The reliability of the State's energy supplies will remain a top priority for the State, and it will take the following steps to develop the 21st century energy infrastructure we need:

- Work with the electric and gas utilities to develop master plans through 2020 that will be responsive to the goals and action items in this plan.
- Foster development of 1500 MW of new cogeneration capacity in New Jersey by 2020.
- Ensure a balance between energy supply and energy demand that is consistent with the State's greenhouse gas targets and provides energy at a reasonable price.

ACTION ITEM 1: The State will work with the electric and gas utilities to develop individual utility territory master plans through 2020 that effectively respond to the goals and action items in this plan, and provides consumers with additional resources to manage their energy consumption.

The goals and action items in this plan will significantly change the current energy infrastructure. Renewable energy technologies, cogeneration development, the need to decrease energy consumption and peak electricity demand, and the possibility of plug in hybrids will alter the demand placed on the energy infrastructure. If this infrastructure is not capable of supporting the action items in this plan, then the reliability of the system could be compromised.

Therefore, the State will work with the electric and gas utilities will develop a master plan for each utility territory that will:

- Identify the necessary upgrades to each utility's infrastructure to ensure the reliability of the system and improve its ability to support the goals and action items in this plan, and
- Identify the structure of the programs which they will propose to successfully and efficiently transition the State's energy efficiency programs to the utilities and effectively put the State on track to meet its 2020 energy consumption targets.

Working with the BPU, Rate Counsel and the Governor's Office the electric and gas utilities will develop individual master plans within 12 months from the release of this plan. Each plan will not be required to be identical, as the characteristics and challenges of each utility's infrastructure and customer base is different. Instead, each plan would be reviewed based on its own technical merits and impacts to ratepayers.

This plan will be updated at least every three years to keep up with revisions to the State's energy policy, technology innovations, and changes in consumer behavior. The development of plug in hybrids is one such example of a technology implementation that may require alterations to the system to accommodate this new demand. Also, technologies such as thermal storage, that support the goals and action items in this plan should also be considered as part of the utility's master plan. Smart grid technologies

will be considered within the broader context of this plan and their abilities to meet the goals and action items in this Energy Master Plan.

There are many definitions for smart grid, but the U.S. Department of Energy's "Modern Grid Initiative" calls for a smart grid system that has the following features[33]:

- Self-healing from power disturbance events
- Enabling active participation by consumers in demand response
- Operating resiliently against physical and cyber attack
- Providing power quality for 21st century needs
- Accommodating all generation and storage options
- Enabling new products, services, and markets
- Optimizing assets and operating efficiently

The State and the electric utilities should use this definition as its framework when evaluating options to modernize the current electrical grid with smart grid technologies.

Advanced metering technologies will be approved based on the results of the pilots described under the demand response action items under Goal 2 of this plan. However, if the BPU and Rate Counsel determine that there are other benefits to rate payers than just demand response, such as increased reliability, increased system efficiencies and downward pressure on bills, then advanced meters could be supported as part of this plan.

Smart grid technologies are currently being piloted around the country to determine their true benefits. Places like Texas, California, and Boulder, Colorado have hosted pilots and demonstration projects of smart grid deployments. New Jersey will use the results of these pilots as part of its review of the best available technologies and support the development of regional demonstration projects in the State that will determine the most effective technologies and designs.

Smart grid technologies offer the potential to do more than just provide advanced meter infrastructure or peak demand reductions. Instead, it provides the State with an opportunity to modernize the electrical grid to a 21st century infrastructure that will enable a wide array of benefits to the end users, the environment and the utilities. It also provides an opportunity for consumers to access real time data about their energy use and access other tools to improve their energy consumption. However, in order for smart grid technologies to be considered in New Jersey they should consist of an open architecture design.

IMPACTS: This action item will create a 21st century energy infrastructure that will ensure the reliability of the system as the demands on the current energy infrastructure change as consumer demands change.

[33] From http://www.doe.energy.gov/smartgrid.htm.

ACTION ITEM 2: Foster the development of 1500 MW of new cogeneration capacity in New Jersey by 2020.

Conventional power plants emit heat as a byproduct of electricity generation. Combined Heat and Power (CHP), or "cogeneration" technology, captures the heat byproduct and "reuses" it, either by heating a building or by using the heat for an industrial process. Cogeneration is a commercially viable technology today that can produce lower-cost power with significantly lower greenhouse gas emissions than separate fossil-fueled power plants and boilers. By strategically placing cogeneration units where both the power and heat byproduct can be used most efficiently, we can improve the reliability of the power supply, reduce the cost of electricity, and lower emissions of air pollutants.

Currently, New Jersey has more than 3,000 MW of installed cogeneration capacity. However, no significant new cogeneration plants have been built in New Jersey since 1999. The barriers have included the sizable initial investment, rising and unstable fuel costs, unfavorable changes in the tax structure and various legal and regulatory concerns. Companies or communities seeking to construct or install low-carbon generation should be given preference by the State. Therefore, an increase by 50% of the amount of installed cogeneration capacity in the State will be a challenge.

In response to this challenge, the DEP, BPU and the Economic Development Authority (EDA) will work together to develop economic and regulatory incentives to spur clean generation construction, especially cogeneration, and to smooth regulatory and legal hurdles to turn waste energy into economically smart and environmentally sounder energy. Specifically, working with the legislature, the following actions will be pursued to create an environment in New Jersey that supports the expansion of cogeneration facilities:

- Identify and alleviate regulatory conflicts across permitting agencies to streamline and simplify approval processes. This will include the DEP's adoption of a general permit for cogeneration facilities where appropriate.
- The use of the Retail Margin Fund to provide rebates to new combined heat and power facilities. Legislation (A2507/S1932) has been introduced to support the use of this fund for combined heat and power facilities. These performance based rebate amounts of at least $450/kW will be critical to encourage private investment in the high upfront capital costs to construct a new cogeneration facility.
- Exempt all fuels used by new and existing cogeneration facilities that meet a minimum efficiency from sales and use tax.

In addition, the BPU staff will develop a list of the necessary regulatory and statutory changes that are necessary to make cogeneration technology available to more customers.

Together, these incentives will help to overcome many of the barriers to cogeneration development and effectively stimulate the development of new cogeneration facilities in the State.

IMPACTS: These incentives could help to stimulate the development of cogeneration facilities in the State which will result in a decreased electricity demand on the electricity grid, thereby further reducing the need for additional generation capacity. Recently, the development of these facilities has been extremely slow, and these incentives should help to encourage the development of new cogeneration facilities. If successful, it is estimated that 1500 MW of additional cogeneration capacity could result in 10,000 GWh of reduced demand on the electrical grid by 2020. This will result in the displacement of more than 33 TBTU of space and process heating requirements from natural gas and heating oil in the commercial and industrial sectors.

ACTION ITEM 3: Ensure a balance between supply and demand of energy that will ensure reliability of electricity and fuel supplies, serve the State's greenhouse gas targets, and provide energy at a reasonable price.

In "deregulated" states such as New Jersey, decisions to invest in or retire power plants are almost entirely made by the developers and owners of the plants. As a result, since 1999, New Jersey has had to rely almost entirely upon market forces to provide a sufficient incentive for new power plants. The same is true for the natural gas and oil markets, as the State has to rely on market forces to ensure that new capacity is built, energy is supplied at an affordable price and that the supply of this energy is reliable.

Demand increases annually at a more rapid pace, given our citizens' increasing reliance on appliances like computers and plasma televisions. Our current fleet of power plants cannot be expected to supply all of this electricity, especially when much of the fleet is aging, expected to retire, or likely to be exporting its power. We have set aggressive goals for maximizing renewable energy and energy efficiency, we have the commitment and the ability to achieve these goals, but we cannot realistically expect that we can meet even our substantially reduced needs through these means alone.

After achieving a 20% reduction in electricity consumption, generating 10,000 GWh of electricity through CHP, and using renewable resources to produce as much as 30% of the remaining demand for electricity, approximately 47,800 GWh of our 2020 demand remains to be met by other generation sources.

Due to the action items in this plan, continued advancement in energy technologies and changes in consumer behavior may result in a demand for different types of energy supply. For instance, the speed with which peaking plants can be brought to market makes them useful in the short term for addressing reliability problems likely to arise if we lose one or more major power plants with little warning. Smaller "distributed generation" plants serving more localized needs, perhaps even at a single industrial facility, can also be developed quickly, can be cleaner and much more efficient than peaking plants. Combined-cycle plants, that are more efficient take a little longer to develop, but are substantially more efficient than peaking plants and therefore more consistent with our goals for reducing both greenhouse gas emissions and electricity prices. Finally, baseload plants, such as coal and nuclear energy can take 5-10 years to

develop, but can be an essential part of a longer-term strategy to ease electricity prices and meet an increased baseload demand. This increase in baseload demand could be the result of electricity load shifting from peak demand to baseload demand, or from the commercialization technologies such as plug in hybrid electric vehicles. All of these types of plants therefore can play an important role in planning our energy future through 2020 and beyond.

However, to date, coal generation plants using carbon sequestration technology have not been placed in commercial operation and no sites in or near New Jersey appropriate for sequestration have yet been identified. Therefore, it is unclear at the present time whether new coal-based plants will be a viable alternative to help the State achieve the greenhouse gas emission reductions called for in the Global Warming Response Act. The 2050 greenhouse gas mandates point towards the need to produce carbon-free electricity at a lower price per megawatt-hour than fossil-fueled plants, including greater reliance on renewable energy technologies, developing nuclear or clean coal technologies, or a combination of these options.

Nuclear energy is another alternative to supplying baseload demand; however there are still several questions and concerns about this technology. Accordingly, the State will charge the stakeholder group of the State Energy Council to issue a report to the Governor by the end of 2009 about the following issues concerning nuclear energy:

- Waste storage issues,
- Projected growth to baseload demand, including alternative scenarios for the utilization of plug-in hybrid electric vehicles
- Available technologies that can environmentally and economically meet baseload demand while not compromising reliability,
- Impacts to ratepayers,
- The appropriate public outreach process that should be undertaken if the State were to consider approving the construction of a new nuclear plant.

Until the State has had an opportunity to review this report, that State will not issue any final approvals for the construction of a new nuclear plant.

While natural gas based generation units emits fewer greenhouse gas emissions than coal fired plants, its fuel source can be less reliable and its cost per BTU is roughly three times the cost for coal. However, natural gas fired plants, have the ability to power up and power down much quicker than its coal and nuclear counterparts, and therefore is better suited to meet the State's peak energy demand.

Natural gas is an essential fuel for the development of CHP and for peaking power. The development of these plants will add to the demand for natural gas. In response, the BPU, as part of the gas utilities master planning effort, will work with the local distribution gas companies (LDCs) and consumer groups to assess the future natural gas needs for New Jersey.

There is confidence that market forces will ensure a sufficient and reliable supply of natural gas to satisfy demand in New Jersey. To support the markets activities to increase

access to natural gas supplies in the State, the BPU staff will still work with the DEP staff, and the LDCs to conduct comprehensive analysis and future needs assessment of pipeline capacity and regional natural gas and liquid natural gas supply to ensure a level of stability in prices impacting New Jersey consumers.

The State also recognizes that the diversification of the State's fuel portfolio can increase reliability, and encourage competition, which may help stabilize energy prices in New Jersey. Therefore, any liquefied natural gas terminal or other fuel supply project that meets the DEP's strictest environmental requirements will be permitted for operation. Otherwise, so long as the State is not committing financial resources to these projects and these risks of development are being fully supported by the merchant developers, then the State policy will be to allow the markets to determine the cost, reliability and quantity of these fuel supply projects.

IMPACTS: Making sure that there is sufficient infrastructure capacity to meet the State's electricity and natural gas needs in the near and longer term requires constant monitoring of the supply and demand equation so that decisions can be made to ensure its reliability. In the near term, new generation should be considered to ensure there is sufficient peak electricity capacity to meet growing demand while the demand response and energy efficiency Action Items are implemented. For the longer term, 2020 and beyond, decisions will need to be made in the near future as to the type and amount of electricity generation that will be needed.

Since it can take a decade to get all the approvals necessary to build a large capacity plant, making those decisions in the next couple of years will allow the State to determine how to achieve the 2050 greenhouse gas emission targets in the Global Warming Response Act. The State Energy Council, described in the Implementation strategy in this plan will be responsible for responding to these challenges as they are identified and ensuring that there is an adequate supply of energy to meet the State's demands.

GOAL 5: Invest in innovative clean energy technologies and businesses to stimulate the industry's growth in New Jersey.

The pursuit of the goals and action items outlined in this plan will not only secure a responsible energy future for the State, but it will also establish New Jersey as an industry center for clean energy businesses. In order to implement the action items in this plan, significant public and private investment will be necessary between now and 2020. This investment will provide a strong encouragement to clean energy businesses to locate their businesses in New Jersey and like the pharmaceutical industry, could become an anchor industry for the State. This industry sector will provide an opportunity to transition New Jersey's industrial jobs to a green low-carbon 21st century economy.

New Jersey has a long history of being the home of innovation and is now home to more than 500 environmental, energy and engineering companies. Building on this history, Governor Corzine's *Economic Growth Strategy for the State of New Jersey 2007*, laid the

groundwork to continue the State's commitment of encouraging innovation and commercialization of technologies. Among its many recommendations, it aggressively encouraged the expansion and creation of clean energy solutions, and declared the clean energy technology sector as a cornerstone of the Edison Innovation Fund and the EDA.

The clean energy technology sector offers hopes to provide a new industry sector that creates jobs while providing new solutions to our energy challenges. With its strong workforce, culture of innovation and large renewable energy and efficiency markets, New Jersey is well positioned to become a major participant in the clean energy technology sector. Therefore, the State must further its investment by expanding efforts to attract and grow this clean energy technology sector by working to implement the following action items:

- Expand efforts that encourage the development of clean energy technologies by expanding the Edison Innovation Fund to invest in innovative clean energy technologies and provide support to business incubators that support clean energy business development.
- Develop timely and industry recognized job training programs to ensure that sufficient numbers of New Jersey workers have the skills demanded by industry to fill the jobs that are created from the action items in this Energy Master Plan
- Establish the Energy Institute of New Jersey to support the basic and applied energy research efforts at the colleges and universities in the State.

ACTION ITEM 1: Expand efforts that encourage the development of clean energy technologies by expanding the Edison Innovation Fund to invest in innovative clean energy technologies and provide support to business incubators that support clean energy business development.

The Governor's Economic Growth Strategy has committed to aggressively encourage the expansion and creation of clean energy solutions, and highlights the clean energy technology sector as a cornerstone of the Edison Innovation Fund administered by the EDA in partnership with the NJ Commission on Science and Technology (CST).

Building on this strategy, the BPU, EDA, and CST are partnering to expand the Edison Innovation Fund to include an *Edison Innovation Clean Energy Technology Commercialization Fund* and an *Edison Innovation Clean Energy Manufacturing Fund*. The overall mission of these new financing sources is to fund innovative renewable energy and energy efficiency technologies which will decrease electricity and heating costs, improve electric reliability and maximize economic and environmental benefit to New Jersey's ratepayers by driving down the cost of key market-transforming efficiency and renewable energy technologies. Achieving this mission will include:

- Providing a range of tools to integrate policies across programs for the commercialization of clean energy technologies including R&D support, gap funding, equity investments, and generating market demand;
- Developing a balanced clean energy industry cluster;

- Supporting technologies that will provide the most benefit to New Jersey ratepayers; and
- Enhancing consumer choice

Through this fund, created through allocation of existing agency resources, the State will leverage $75 million over five years to attract over $200 million in private venture investment in clean energy technology companies. The CST will offer assistance by providing commercialization grants to develop or commercialize prototype renewable energy and energy efficient equipment, and products. The EDA will offer assistance in the form of grants and loans to companies manufacturing renewable energy, or clean and energy efficiency equipment and products in New Jersey. The expanded fund will ultimately provide NJ customers with greater access to these products by developing state of the art renewable energy manufacturing facilities in New Jersey.

This Fund will partner with other organizations that represent capital sources, including private industry and New Jersey's research universities to help commercialize promising new technologies.

Furthermore, the EDA and CST will continue to identify gaps in the marketplace in order to utilize financial resources and RGGI auction proceeds in creative ways to address the unmet needs in the clean energy sector. This will include the support of business incubators aimed at clean technology entrepreneurs and research and development, as well as vehicles to attract socially minded "angel investors" to invest in this sector.

The early stage financing risk and the high capital costs of constructing commercial-scale facilities often proves to be a difficult obstacle for these clean energy generation companies to overcome. However, as advancements in renewable and alternative energy sources advance, New Jersey will be served well to establish itself as the home to these new technology businesses.

IMPACTS: While using existing State resources, the Fund offers New Jersey with an opportunity to invest in and host leading new clean energy solutions. This will help grow the clean energy industry in New Jersey, and should be coordinated with the State's green collar jobs initiative.

ACTION ITEM 2: Develop timely and industry recognized job training programs to ensure that sufficient numbers of New Jersey workers have the skills demanded by industry to fill the jobs that are created from the action items in this Master Plan.

Meeting the Energy Master Plan's aggressive targets for energy efficiency, renewable energy, demand response, and new generation will require tremendous growth in the "green collar" jobs sector, from solar manufacturing and energy audits to HVAC installers and smart grid technology installations.

It is estimated by the R/ECON™ model that this plan will result in $33 billion of investment into the energy infrastructure in New Jersey, which will result in the creation of 20,000 jobs between now and 2015. Of this job growth, it is estimated that approximately half will come from installation and construction jobs and the other half will be operations and maintenance jobs.

To meet this job demand, the State will need to grow its green collar local labor force. Curriculum alignment and workforce training will be an essential component to driving this development. In addition, because our urban centers are often centers for electricity congestion and industry, growing green collar jobs in our cities will play an important part in meeting our goals.

The Department of Labor has formed an Industry Workforce Advisory Council (IWAC) to convene senior human resources representatives from the energy sector with the State's agencies working on workforce development, higher education, and training programs. The IWAC will provide a forum for representatives from the energy sector to tell the state about the critical workforce skill needs of their industry. The State will use this information to help shape curriculum development, ensure that New Jersey's education and training institutions are able to deliver industry-recognized credentials that are in demand by businesses, and allocate training funds strategically.

IMPACTS: If New Jersey is to compete with its surrounding states, it will need to demonstrate that it has the skilled workforce for these companies to locate, expand and stay in the state. The development of a "Green Collar" jobs program will ensure that New Jersey's workforce has the job training and skills necessary to support these companies. These jobs will keep energy dollars that might have been exported out of New Jersey in the State and help employ New Jersey citizens.

ACTION ITEM 3: Establish the Energy Institute of New Jersey to support basic and applied energy research efforts at the colleges and universities in the State.

Currently, there are tremendous energy research activities happening at New Jersey's colleges and universities, including Rutgers University, Princeton University and NJIT. These research activities, along with other efforts around the country, provide potential breakthroughs in technology that will provide policy makers with new solutions to current and future energy challenges.

Therefore, the State will establish an Energy Institute of New Jersey (EINJ) to:

- Develop collaborations between State, regional, national and international entities engaging in research efforts.
- Provide additional resources to promising research activities that are consistent with the State's energy policy priorities.
- Incorporate input from entities such as the electric and gas utilities, and other energy industry leaders to identify energy research priorities.

- Serve as a mechanism for applying for federal research grants and funds from State and private institutions to fund clean energy research being undertaken by collaborations of the represented colleges and universities, and with clean energy businesses.

The EINJ, in its efforts to advance the State's research, development and demonstration (RD&D) efforts in the energy sector, will advance new technologies and channel additional funding sources, such as federal funds and private grants, in support of the goals of the EMP. The strategic partnerships developed by the EINJ will identify, secure and leverage public and private funds, ensure that research efforts are complimentary where necessary, build upon successful RD&D work at other institutions, develop new ideas, and ensure that the RD&D efforts provides benefits to the state's energy consumers. It will also provide policy direction to aid in the advancement of the State's energy related RD&D efforts.

The EINJ will consist of a Board with representatives from the BPU, DEP, CST, EDA, the Commission on Higher Education, participating State universities and colleges, and electric and gas utility companies in New Jersey. In addition, representatives from other research institutions (such as the National Renewable Energy Laboratory and Cal Berkeley), and the State's industry leaders in the field of clean energy also will be invited to be members of this Board. The Board will identify additional public and private resources to be applied to basic and applied energy research activities by the State's universities and colleges, and ensure that these efforts are coordinated with the State's energy policies.

The research areas that the EINJ will focus on will be developed in coordination with the State Energy Council and will focus on energy technology developments such as:

- Energy Efficiency
- Demand Response
- Advanced Meter and Advanced Grid Technologies
- Renewable Energy
- Energy Storage
- Transmission and Distribution
- Transportation (e.g. plug-in hybrid electric vehicles)
- Other Greenhouse Gas Emission Reduction Efforts

IMPACTS: The EINJ will build on the existing strengths of New Jersey's universities and colleges in the area of clean energy technology research to coordinate their efforts in order to achieve greater impact, by working in concert with New Jersey's energy policy and industry leaders. These efforts will help to make New Jersey a national leader for the RD&D efforts that will provide alternative solutions to the energy challenges that currently face the state and nation.

IMPLEMENTATION

In order to effectively implement the recommendations outlined in this plan, it is necessary to create an organizational structure that is comprised of various state agencies that have a vested stake in energy policy. These representatives have the ability to identify energy challenges, shape policy, promulgate regulations and most importantly align state agency programs and policies to provide for a prosperous and sustainable energy future.

Therefore, the Governor will establish a State Energy Council to ensure that the goals and action items in the Energy Master Plan are being achieved. Specifically, this council will be responsible for:

- Conducting an annual review to be submitted to the Governor of progress made towards achieving the goals and action items in the EMP.
- Identifying regulatory and statutory changes that are necessary to meet the energy challenges facing the State.
- Updating the Energy Master Plan every three years.

Activities such as monitoring and ensuring an appropriate balance between energy supply and demand will be one of the responsibilities charged to this body. If this balance is threatened, the Council will issue a report to the Governor identifying the reason for this imbalance, and the potential solutions to resolve this challenge. This council will ensure that all of the goals and action items in the Energy Master Plan are being achieved, and that energy challenges threatening the environment, reliability and affordability of energy are addressed in a timely and comprehensive manner.

The Council will include the following 12 members:

- Governor's Office
- Office of Economic Growth
- Board of Public Utilities
- Department of Environmental Protection
- Department of Transportation
- Department of Community Affairs
- Economic Development Authority
- Department of Labor and Workforce Development
- Department of Treasury
- Commission on Science and Technology
- Department of the Public Advocate
- Director of Energy Savings in the Department of Treasury

Each Department on the Energy Council will be required to designate a staff person to be responsible for the implementation and oversight of the goals and actions items that are relevant to their department. The Governor or his designee will chair the council.

The Council will be advised by a stakeholder group and will meet quarterly. The stakeholder group will consist of business, environment, consumer, energy and community leaders from across New Jersey. This body will be appointed by the Governor and will play a critical role in the development and implementation of the

State's energy policies. The first task for this stakeholder group, once formed, will be to develop the report on nuclear energy that is described in Goal 4 of this plan.

THE STATE MUST LEAD BY EXAMPLE

The State will work with its counties, local municipalities and school boards to implement policies and programs to lead in meeting the goals of the Energy Master Plan. It will lead by example to reduce its energy consumption, increase its use of renewable and alternative fuels, and reduce its overall contributions to greenhouse gas emissions.

New Jersey State Government spends an estimated $171 million a year on energy, consuming 7 trillion BTUs, which results in the emission of 739,000 metric tons of carbon dioxide. State agencies occupy space in over 4,000 buildings and operate a fleet of over 14,000 vehicles.

Figure 17 and Figure 18 show the State's total energy consumption by fuel type and its energy expenditures by department. Electricity and natural gas make up 64% of the State's total energy consumption.

With such a significant infrastructure, State operations have a meaningful impact on New Jersey's carbon footprint. By implementing initiatives outlined in the Energy Master Plan within State government operations, the State will assume its responsibility to set an example of energy conservation and management.

To ensure that the State is leading the way, Governor Corzine created the Office of Energy Savings through an Executive Order signed on April 22, 2006. Through this Office the State has centralized its efforts to increase energy efficiency, reduce energy use and improve the procurement of energy for all State facilities.

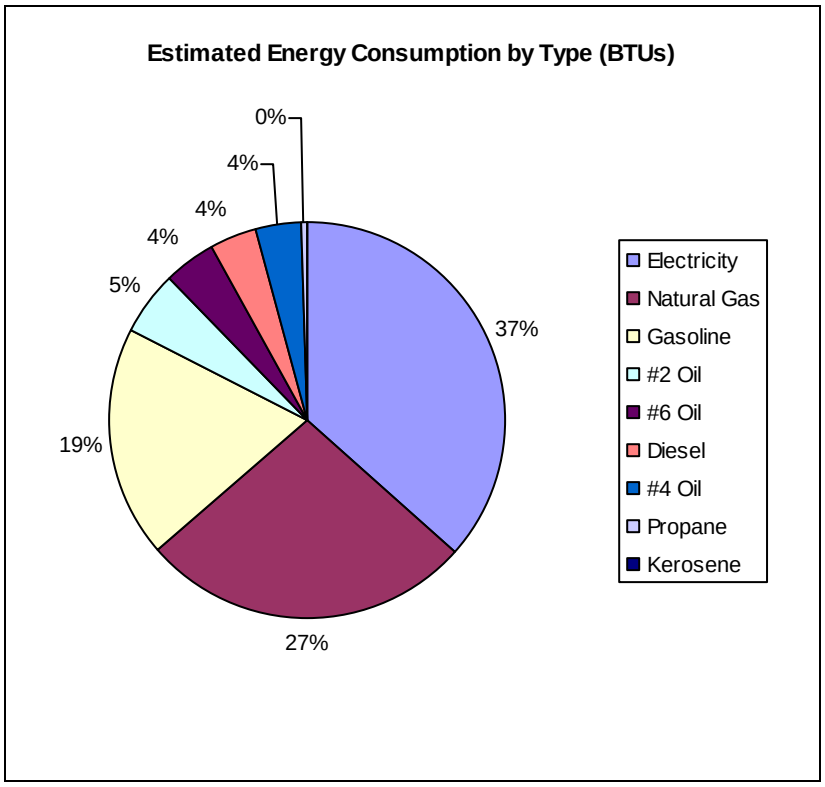

Figure 17: Energy Consumption by the State.

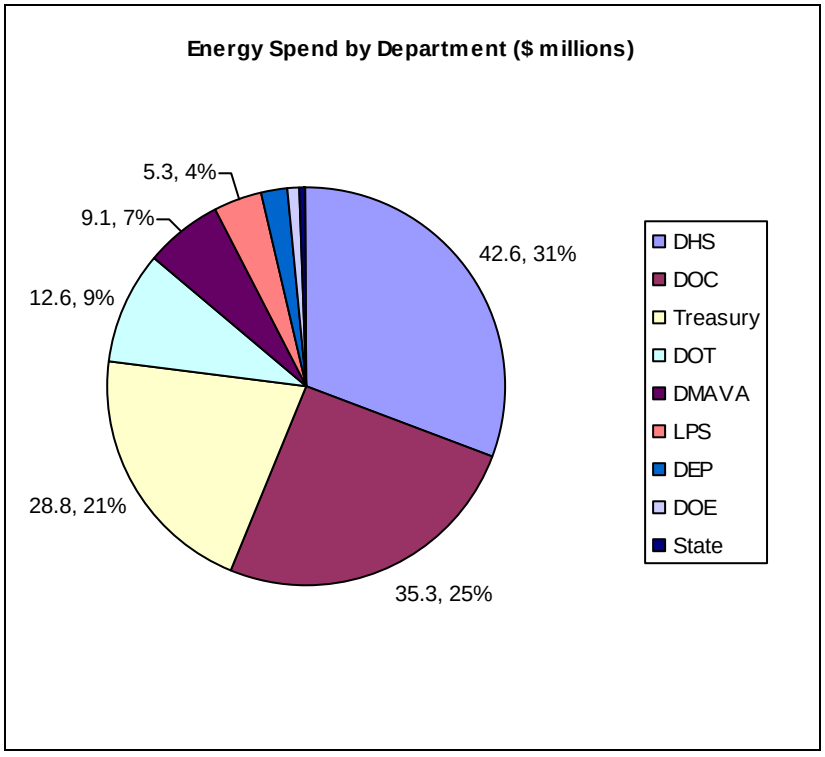

Figure 18: Energy Expenditures by Department

The Office of Energy Savings continues to identify cost-effective projects that will substantially reduce the State's energy consumption and cost. In fact, eleven facility projects are in the design stage and are expected to reduce energy use by another 25 billion BTUs, reduce carbon dioxide emissions by another 8,000 metric tons, and reduce energy costs by $1.5 million annually. Further, these projects are expected to pay for themselves in less than six years.

Action Item 1: Operate State facilities and equipment as efficiently as possible.

Over the past year, the Office of Energy Savings has begun to implement new management practices for reducing energy use that can be emulated by New Jersey's businesses and residences. The following is a list of the illustrative actions taken over the past year that have laid the groundwork for changing the State's energy future.

- Prioritized energy audits in the downtown Trenton office buildings and implemented immediate energy conservation measures, like adjusting the operating schedules for lighting, heating and cooling systems. These measures are expected to reduce annual energy consumption by 22 billion BTUs, reduce energy cost by $820,000 and reduce carbon dioxide emissions by 3,000 metric tons. That is equivalent to removing 400 cars from our roads.
- As a demonstration project, embarked on a lighting upgrade in the Statehouse, to increase energy efficiency and reduce lighting electricity consumption by 58%. This project uses fluorescent lighting technology with low-wattage and low-mercury lamps. The new lamps last much longer, resulting in reduced maintenance costs for the State.
- Developed a new recycling program and contract for 90 State facilities. This new program provides new recycling bins, labels, and easier sorting of the State's recyclables. The new vendor is also tracking recycling performance so the State can make continuous improvements going forward. This past year, the State recycled over 1,600 tons of paper, glass, aluminum, cardboard, and plastic with the new program, reducing greenhouse gas emissions by 2,478 metric tons.
- The State was recognized this past year for achieving the first Energy Star rating for a State building in New Jersey. This recognition of superior energy performance at the Mary Roebling building in downtown Trenton came after a significant turnaround effort this past year to identify areas of energy waste and make immediate improvements at this facility. This resulted in a 22% reduction in energy use for this high-rise office building.

In addition, the State will develop an online Energy Tracking System (ETS) to hold each department accountable for their energy use, cost, and environmental impact. The ETS will compile energy usage data from all utility and supplier invoices so energy consumption tracking and performance reporting can be provided for each State building and department.

The ETS will also expand the use of Energy Star scoring for State buildings and allow centralized oversight by the Office of Energy Savings. This will permit a focused approach to identifying buildings in need of improvement, prioritizing energy efficiency investments, and putting useful energy consumption information into the hands of the facility personnel who are best equipped to take immediate conservation actions. This new system will serve as the foundation of the State's energy savings program and will be up and running in 2009.

Also, the State will explore a new revenue stream by providing relief to the electricity grid during high demand times. By shutting off pre-selected, non-essential equipment during times of great electrical congestion, the State can remove electricity load from the grid, and be eligible for financial incentives. This type of demand response program should be in place by the end of 2008.

Action Item 2: Pursue Immediate Energy Conservation Measures

The Office of Energy Savings will use the information from the ETS to work with State agencies in evaluating energy performance metrics, such as building energy intensity and Energy Star scores. This will permit a ranking of State buildings to determine which are underperforming and in need of improvement. Then, technical resources will be deployed to assist State agencies in investigating problem areas further. This will include on-site building energy reviews using a team approach. These reviews will enable personnel with energy, operations, and maintenance expertise to work together in identifying immediate actions that can reduce facility energy consumption.

These immediate conservation measures will include improvements like optimizing building control settings, using setback temperature and lighting settings during off hours, and improving maintenance practices which can reduce building energy consumption. In fact, this is already underway in downtown Trenton where the State has seen a 9% improvement in Energy Star scores this past year. These measures are expected to reduce annual energy consumption by 22 billion BTUs, reduce energy cost by $820,000, and reduce carbon dioxide emissions by 3,000 metric tons. That is equivalent to removing 400 cars from our roads. Across all facilities, this type of energy conservation is expected to reduce State energy consumption by 5-10%.

Action Item 3: Invest in Cost Effective Energy Efficiency Projects

The State has already begun investing in energy efficiency and renewable energy projects. For example, the State has committed $8 million to ten such projects that are expected to reduce annual energy cost by $1.5 million, reduce energy consumption by 32 billion BTUs, and reduce greenhouse gas emissions by 8,000 metric tons. These projects are expected to pay for themselves in less than six years and include upgrades to lighting, building controls, heating and cooling systems, and building insulation.

The State also opened the Regional Operations Intelligence Center, a cutting-edge building that now serves as the foundation for the state's Homeland Security operations. The facility is heated and cooled by a geothermal system, which will eliminate 89,000 pounds of carbon dioxide annually versus using conventional energy sources. In addition,

a roof-mounted solar system is generating 20% of the facility's electricity needs, further reducing energy costs by an estimated $2.4 million over the life of the system.

The Office of Energy Savings will also work with Treasury's Division of Property Management and Construction to develop standards and guidelines to ensure energy efficient design and construction for all State facility projects by the end of 2008. These higher standards will increase energy efficiency, reduce life cycle costs, and reduce greenhouse gas emissions. This will also include meeting high-performance green standards (LEED Silver) for all newly constructed State buildings over 15,000 square feet.

Action Item 4: Work with the State Legislature To Create an Energy Savings Improvement Program.

Given its current fiscal constraints, the State and government agencies must have additional options to fund energy improvement project, other than relying on long-term debt. Existing law creates a variety of obstacles for the State, local government, and educational institutions seeking to enter into comprehensive contracts for energy efficiency. A comprehensive Energy Savings Improvement Program would use government-appropriate contracting mechanisms and introduce technical resources and new funding options to complete energy improvements for a wide range of government facilities.

It would also allow all government agencies to undertake a more comprehensive approach to becoming energy efficient and enable moving beyond low-hanging fruit, such as lighting retrofits, to higher value projects, such as boiler replacement and comprehensive facility re-engineering. This program would eliminate the need to appropriate new funds to pay for these projects and would allow monthly payments to be sourced from existing energy funds. By working with the State Legislature and Stakeholders, we will address obstacles for State buildings to engage in energy savings contracts and explore the opportunities for local governments and schools.

Action Item 5: Optimize our Energy Supply Portfolio to reduce greenhouse gas emissions.

In addition to its efforts to curb the State's energy demand, the Office of Energy Savings will spearhead the State's effort to increase its use of renewable energy technologies, increase the efficiency of its existing Combined Heat and Power plants, phase out the use of heavy fuel oils for facility boilers, and increase the use of biodiesel for the fleet.

Over the next year, the Office of Energy Savings will work with our two Combined Heat and Power (CHP) plant vendors to increase plant capacity and efficiency through equipment replacement and system upgrades. The State will also seek to develop new CHP projects by 2010, as these plants simultaneously produce electrical and thermal energy from a single fuel source and can be more energy efficient than conventional energy supplies.

The State will phase-out the use of heavy fuel oil in facilities. This is best illustrated by projects already underway including two boiler conversions to switch from #4 and #6 oil to cleaner-burning natural gas. These projects, including the one at Trenton Psychiatric Hospital, will increase efficiency and reduce greenhouse gas emissions by 5,400 tons, which is equivalent to removing more than 700 cars from the road.

The State also needs to expand its use of biodiesel to more State fueling locations. Conventional petroleum diesel will be replaced by B20 (20% biodiesel / 80% diesel blend) to reduce the State's petroleum consumption and greenhouse gas emissions. The DEP's oversight will ensure that the State purchases biodiesel produced using sustainable methods.

For renewable electricity supply, the State is investing in three new on-site solar systems, including one on the roof of the DEP building and the new Health Lab, with construction planned for 2009. The Office of Energy Savings will also work with the Board of Public Utilities and other agencies to develop a competitive bidding process that will enable State and local governments to join forces, maximize buying power, and partner with the private sector to significantly increase the amount of in-state solar power capacity. By using public buildings and land to host the new solar systems and purchase the output, this program can expand in-state solar capacity significantly without incurring additional public debt. The initial phase of this program will seek to develop 5 megawatts of new solar projects, with competitive bidding expected in early 2009.

Action Item 6: Develop a State Demand Response Program

The State will explore a new revenue stream by providing relief to the electricity grid during high demand periods. By shutting off pre-selected, non-essential equipment during times of high demand, the State can remove electricity load from the grid and be eligible for financial incentives. Options for utilizing the State's on-site generating equipment with appropriate emission controls will also be considered. The competitive procurement process is already underway for this program, which will enable the State to retain a Curtailment Service Provider who will assist in developing and managing this program across multiple facilities and agencies.

CONTINUED ADVOCACY& ANALYSIS

Unfortunately, New Jersey does not have absolute control over the future of its energy infrastructure. Many decisions that affect the State's energy infrastructure are made by the regional transmission organization, PJM and the federal regulatory body FERC. The policies and actions of the PJM and FERC can affect the type of generation that is being built, the location and expansion of transmission lines, and the cost of electricity. As the State moves forward with implementing the action items in this Energy Master Plan, it will need to work closely with PJM and FERC to coordinate investments in the regions electricity infrastructure. Changes in peak demand or energy consumption may change the infrastructure improvement plans being developed by PJM and FERC, and the opposite is true.

Therefore, New Jersey must ensure that it is part of the decision making at PJM and FERC by implementing the following action items:

- Work with PJM and the FERC to modify or replace the RPM, with a mechanism that focuses incentives on new generation capacity, demand response, and energy efficiency.
- Actively participate in PJM's planning of the electric transmission system to better protect New Jersey's economy and the environment.
- Litigate decisions by the FERC that threaten substantial increases in New Jersey electricity prices, substantial decreases in reliability, or increases in our contribution to global warming.

Work with PJM to modify or replace the Reliability Pricing Model, with a mechanism that focuses incentives on new generation capacity, demand response, and energy efficiency. The first five years of RPM's capacity prices will cost New Jersey customers more than $7 billion – more than enough to fund the construction of several new power plants outright. Unfortunately, that money is being spread amongst all capacity resources, with only a sliver reaching new power plants or demand response.

Both RPM and the direct State actions described in the plan are intended to narrow the gap between supply and demand in New Jersey. However, the direct State actions will achieve more certain results than RPM, and will tailor those results more closely to New Jersey's specific economic and environmental needs. New Jerseyans should not have to pay for RPM above and beyond the costs of more wisely targeted efforts.

Therefore, the State will continue its advocacy, with the goal of modifying or replacing the RPM with something that will produce better results while being more cost-effective and takes into consideration energy efficiency and demand response efforts.

Help to shape PJM's planning of the electric transmission system to better protect New Jersey's economy and the environment. PJM has determined that the reliability of our supply of electricity will be jeopardized over the next several years, unless steps are taken to address the state's energy demand and supply. Since PJM is responsible for planning and operating the transmission grid reliably, it is in the process of directing upgrades to the grid that will enable New Jersey to import more electricity. These imports will come primarily from coal production regions where coal-based electric generation is prevalent. In other words, our efforts to cut greenhouse gas emissions within New Jersey's borders will be undermined if the shortage of electricity supply is solved by importing more coal-based electricity.

The prospect of increased greenhouse gas emissions is only one reason to avoid increasing our reliance on imports of coal-based electricity. Just as importantly, hopes that these imports would bring us greater reliability and lower prices are likely to be dashed. The prospect of federal limits on power plant emissions of greenhouse gases is creating major uncertainty about what coal-based power will cost. In addition, demand

for coal is increasing, as coal is becoming more difficult and expensive to mine and transport, and recent history has featured disruptions in coal supply and spikes in coal prices. All of these factors suggest that it would be irresponsible to stake our energy future on increased imports of coal-based electricity.

New Jersey will continue to work closely with PJM, to ensure that the transmission planning will reflect real State actions to increase in-state supply and reduce demand, and that transmission planning does not undermine the State's economic and environmental goals.

Concerns about future fuel supplies. New Jersey's energy decisions cannot be made in a vacuum, without taking into consideration national and international concerns. The Energy Information Administration is a statistical agency of the U.S. Department of Energy. Every year the EIA provides an annual overview of the country's current and projected energy supply and demand.

This information is useful as recent increases in demand for electricity coupled with recent disruptions in the supply of fuel sources have resulted in increased costs of generating electricity. Changes in energy supply and demand are difficult to predict, and are influenced by many factors including; increasing energy prices; increased demand for energy in developing countries; increased costs to transport energy fuel sources; and recently adopted legislation and regulations in the United States and other countries (such as the Regional Greenhouse Gas Initiative).

Table 4 shows the EIA estimate of total energy supply and demand from 2006 through 2030.

Energy and economic factors	2006	2010		2020		2030	
		AEO2008	*AEO2007*	*AEO2008*	*AEO2007*	*AEO2008*	*AEO2007*
Primary energy production (quadrillion Btu)							
Petroleum	13.16	15.03	14.42	15.71	14.85	14.15	13.71
Dry natural gas	19.04	19.85	19.93	20.24	21.41	20.00	21.15
Coal	23.79	23.97	24.47	25.2	26.61	28.63	33.52
Nuclear electricity	8.21	8.31	8.23	9.05	9.23	9.57	9.33
Hydroelectricity	2.89	2.92	3.02	3.00	3.08	3.00	3.09
Biomass	2.94	4.05	4.22	6.42	4.69	8.12	5.26
Other renewable energy	0.88	1.51	1.18	2.00	1.33	2.45	1.44
Other	0.50	0.54	0.67	0.58	0.89	0.64	1.12
Total	**71.41**	**76.17**	**76.13**	**82.21**	**82.09**	**86.56**	**88.63**
Net imports (quadrillion Btu)							
Petroleum	26.69	23.93	25.19	24.03	28.92	26.52	34.74
Natural gas	3.56	3.96	4.67	3.66	5.48	3.28	5.59
Coal/other (- indicates export)	-0.28	-0.84	-0.19	1.06	0.93	1.86	1.57
Total	**29.98**	**27.04**	**29.66**	**28.75**	**35.33**	**31.66**	**41.90**
Consumption (quadrillion Btu)							
Liquid fuels	40.06	40.46	41.76	42.24	46.52	43.99	52.17
Natural gas	22.30	23.93	24.73	24.01	27.04	23.39	26.89
Coal	22.50	23.03	24.24	25.87	27.29	29.90	34.14
Nuclear electricity	8.21	8.31	8.23	9.05	9.23	9.57	9.33
Hydroelectricity	2.89	2.92	3.02	3.00	3.08	3.00	3.09
Biomass	2.50	3.01	3.30	4.50	3.64	5.51	4.06
Other renewable energy	0.88	1.51	1.18	2.00	1.33	2.45	1.44
Net electricity imports	0.19	0.18	0.04	0.17	0.04	0.20	0.04
Total	**99.50**	**103.30**	**106.50**	**110.80**	**118.16**	**118.00**	**131.16**
Liquid fuels (million barrels per day)							
Domestic crude oil production	5.10	5.93	5.67	6.23	5.89	5.59	5.39
Other domestic production	3.19	3.69	4.03	4.46	4.49	4.85	5.08
Net imports	12.45	11.39	11.79	11.36	13.56	12.41	16.37
Consumption	20.65	20.99	21.59	21.96	24.03	22.80	26.95
Natural gas (trillion cubic feet)							
Production	18.57	19.35	19.42	19.73	20.86	19.49	20.61
Net imports	3.46	3.85	4.55	3.55	5.35	3.18	5.45
Consumption	21.66	23.25	24.02	23.33	26.26	22.72	26.12
Coal (million short tons)							
Production	1,177	1,179	1,202	1,281	1,336	1,467	1,704
Net imports	-15	-34	-7	46	41	78	68
Consumption	1,114	1,145	1,195	1,327	1,377	1,545	1,772
Prices (2006 dollars)							
Imported low-sulfur, light crude oil (dollars per barrel)	66.02	74.03	59.23	59.70	53.64	70.45	60.93
Imported crude oil (dollars per barrel)	59.05	65.18	52.76	51.55	47.89	58.66	53.21
Domestic natural gas at wellhead (dollars per thousand cubic feet)	6.42	6.33	5.93	5.44	5.39	6.63	6.16
Domestic coal at minemouth (dollars per short ton)	24.63	26.16	24.94	22.51	22.24	23.32	23.29
Average electricity price (cents per kilowatthour)	8.9	9.2	8.3	8.6	8.1	8.8	8.3
Economic indicators							
Real gross domestic product (billion 2000 dollars)	11,319	12,453	12,790	15,984	17,077	20,219	22,494
GDP chain-type price index (index, 2000=1.000)	1.166	1.26	1.253	1.52	1.495	1.871	1.815
Real disposable personal income (billion 2000 dollars)	8,397	9,472	9,568	12,654	13,000	16,246	17,535
Value of manufacturing shipments (billion 2000 dollars)	5,821	5,997	6,298	7,113	7,779	7,997	9,502
Primary energy intensity (thousand Btu per 2000 dollar of GDP)	**8.79**	**8.30**	**8.33**	**6.93**	**6.92**	**5.84**	**5.83**
Carbon dioxide emissions (million metric tons)	**5,890**	**6,011**	**6,214**	**6,384**	**6,944**	**6,851**	**7,950**

Notes: Quantities are derived from historical volumes and assumed thermal conversion factors. Other production includes liquid hydrogen, methanol, and some inputs to refineries. Net imports of petroleum include crude oil, petroleum products, unfinished oils, alcohols, ethers, and blending components. Other net imports include coal coke and electricity. For nuclear electricity, both production and consumption numbers are based on its fossil-fuel-equivalent energy content.

Table 4. Total energy supply and disposition in the EIA's AEO2008 Overview.[34]

While this information paints a national picture of the future energy supply and demand, it is unable to take into consideration regulatory changes that may work to encourage the development of one fuel source over another. Specifically, the outlook acknowledges that liquefied natural gas (LNG) is a key uncertainty and with increased competition for

[34] Energy information Administration *AEO 2008 Overview*

LNG fuel supplies, the amounts available to the United States may "vary considerably from year to year."

Some infrastructure upgrades of the local transmission systems and pipelines can help to mitigate some of these impacts by increasing local reliability and supply. However, given the plethora of factors that influence energy prices, it is uncertain as to whether these upgrades will also provide price stability.

The State will continue to monitor the data, forecasts and analysis that are provided by the EIA in the formulation and evaluation of future and current energy policies.

Complete the review of the BGS auction process. Since 2002, the BPU has been overseeing auctions for the right to supply energy, capacity, and all other needs for BGS. The price resulting from the auctions has nearly doubled since 2002. Accordingly, the BPU will intensify its examination of the auction, thoroughly reviewing not only the details of the current auction process but also the concept of the auction itself. The process will be a transparent, public proceeding with all necessary expertise and will conclude before any auction in 2009.

ALTERNATIVE SCENARIO

In 2005, New Jersey's homes and businesses used almost 83,000 gigawatt-hours (GWh) of electricity and over 600 trillion British Thermal Units (BTU) of natural gas and heating oil, at a total cost of over $16.8 billion. In 2005, these energy costs consumed about 4.4% of total New Jersey personal income.[35]

Unless New Jersey acts decisively to reduce energy demand and increase supply of low carbon emitting, reliable and reasonably priced energy the state faces an increasingly costly and unsustainable energy future. If no action steps are taken, and the "business as usual" scenario is pursued, in 2020 New Jersey's homes and businesses will use 97,800 GWh of electricity and over 542 trillion BTUs of natural gas and heating oil at a cost of $30.7 billion. The average household would spend more than $1,700 on electricity, more than $1,800 on heating fuels (including natural gas and heating oil).

However, the series of action items proposed in this Energy Master Plan will effectively reduce the State's energy consumption 20% by 2020, contribute to the goal of reducing greenhouse gas emissions to 1990 levels by 2020, and ensure that the energy infrastructure provides reasonably priced and reliable energy to New Jersey's homes and businesses. The DEP's report in response to Executive Order 54 and the Global Warming Response act will also expand on the measures that need to be taken to ensure that the State is on target to meet its 2020 and 2050 greenhouse gas targets. All future policies concerning energy generation will be evaluated to ensure that they are consistent with these targets.

If the action items are fully implemented, the electricity and heating fuels sectors will decrease significantly. In 2004, the electricity and heating fuels sectors emitted a total of 80.6 million metric tons (MMT) of carbon dioxide. The "business as usual" has this amount increasing to nearly 84 MMT of carbon dioxide emissions in 2020, while the current EMP scenario (including the energy efficiency, demand response, cogeneration, and renewable energy action items), effectively reduces the amount of carbon dioxide to 56.1 MMT in 2020. The 2020 target requires greenhouse gas emissions to be at 1990 levels by 2020 or 72.8 million metric tons for the electricity and heating sectors. The EMP scenario would achieve greenhouse gas emissions that are 23% below that target. Further investment in low carbon emitting power plants will further reduce New Jersey's 2020 greenhouse gas emissions. This reduction in greenhouse gas emissions will help New Jersey meet its aggressive 2020 and 2050 greenhouse gas targets.

In addition, the actions in this Plan will also help save the State and its consumers, money between now and 2020. It is estimated that, if the action items in this Plan are fully implemented, by 2020 New Jersey's homes and businesses will use 78,300 GWh of

[35] New Jersey Department of Labor & Workforce Development, Total Personal Income by State,1998 – 2006, http://www.wnjpin.net/OneStopCareerCenter/LaborMarketInformation/lmi10/tpi.htm.

electricity and approximately 443 trillion BTUs of natural gas and heating oil, and save more than $30 billion in its total annual energy expenditures between 2010 and 2020.

Table 5 compares the 2020 electricity consumption, electricity rates and average customer bill, for each of the consumer classes in the "business as usual" scenario, the EMP alternative scenario, and the data from 2005.[36]

Electricity (Does Not Include Transportation/Other Electricity Consumption)

	Retail PRICE $/kWh	Average kWh/Customer	Average Annual Customer Bill	Total Sector Expenditures (billions of nominal $)
2005 Baseline				
Residential	$0.12	9,000	$1,080	$3.60
Commercial	$0.11	87,300	$9,603	$4.38
Industrial	$0.10	868,000	$86,800	$1.19
Behind-the-Meter CHP	*n/a*	*n/a*	*n/a*	*n/a*
TOTAL				$9.17
2020 BAU				
Residential	$0.20	8,800	$1,721	$6.65
Commercial	$0.17	92,300	$15,734	$8.49
Industrial	$0.14	668,300	$95,975	$1.51
Behind-the-Meter CHP	*n/a*	*n/a*	*n/a*	*n/a*
TOTAL				$16.65
2020 EMP				
Residential	$0.21	6,400	$1,339	$5.19
Commercial*	$0.18	56,000	$9,922	$5.35
Industrial*	$0.15	470,800	$68,370	$1.07
Behind-the-Meter CHP	*n/a*	*n/a*	*n/a*	*n/a*
TOTAL				$11.61
% Change from BAU to EMP in 2020				
Residential	7%	-27%	-22%	-22%
Commercial	4%	-39%	-37%	-37%
Industrial	1%	-30%	-29%	-29%
TOTAL				-30%

Table 5: Electricity Price and Consumption Comparison of 2005 Baseline, 2020 BAU and 2020 Alternative Scenarios.

The EMP alternative scenario reduces total electricity expenditures by 30% in 2020 compared to the "business as usual" scenario. While electricity rates largely stay the same between the scenarios, the amount of energy consumed is greatly reduced through

[36] Source: 2005 data from EIA Form 861; projection data from R/Econ™ model output 12/03/07; projected growth rates for # of customers calculated using historical growth rates from EIA Form 861.

efficiency measures. Also, the "business as usual" model assumes greater risk in energy supplies and prices as it has an increased reliance on fossil fuel based generation, while global demand for energy continues to increase. The additional risks assumed under this model can not be quantified given the uncertainty about future risks and trends.

Table 6 below shows the projected impacts on heating fuels (natural gas and fuel oil) in each of the consumer classes in the "business as usual" scenario, the EMP alternative scenario, and the data from 2005. These projections include the total impacts if all of the action items in this Plan are implemented, including energy efficiency, energy conservation and cogeneration. The economic impacts of cogeneration on electricity rates are captured in the Table 5.

Heating Fuels (Including CHP)

	Natural Gas Retail PRICE $/mmBtu	Fuel Oil Retail PRICE $/mmBtu	Average Annual Customer Bill	Total Sector Expenditures (billions of nominal $)
2005 Baseline				
Residential	$11.24	$15.95	$1,012	$3.50
Commercial	$11.34	$13.01	$9,642	$2.30
Industrial	$10.16	$12.78	$92,257	$0.88
TOTAL				$6.67
2020 BAU				
Residential	$26.09	$21.94	$1,826	$5.74
Commercial	$22.32	$18.95	$18,746	$4.69
Industrial	$19.08	$17.35	$171,547	$1.14
TOTAL				$11.57
2020 EMP				
Residential	$28.51	$22.01	$1,140	$3.99
Commercial	$22.72	$19.03	$22,038	$5.68
Industrial	$19.43	$17.42	$191,552	$1.36
TOTAL				$11.03
% Change from BAU to EMP in 2020				
Residential	9%	0.3%	-37.6%	-30%
Commercial	2%	0.4%	17.6%	21%
Industrial	2%	0.4%	11.7%	19%
TOTAL				-5%

Source: 2005 data from EIA Form 861; projection data from R/Econ™ model output 09/30/08.

Table 6: Heating Fuels Comparison of 2005 Baseline, 2020 BAU and 2020 EMP Alternative Scenarios.

In total the action items in this Plan are estimated to save New Jersey energy consumers $6.4 billion in 2020 and $30 billion from 2010 through 2020, compared to the "business as usual" scenario. Figure 19 compares the total cost savings to each consumer group in

the EMP alternative scenario to the 2020 “business as usual” scenario and the 2005 annual expenditures.

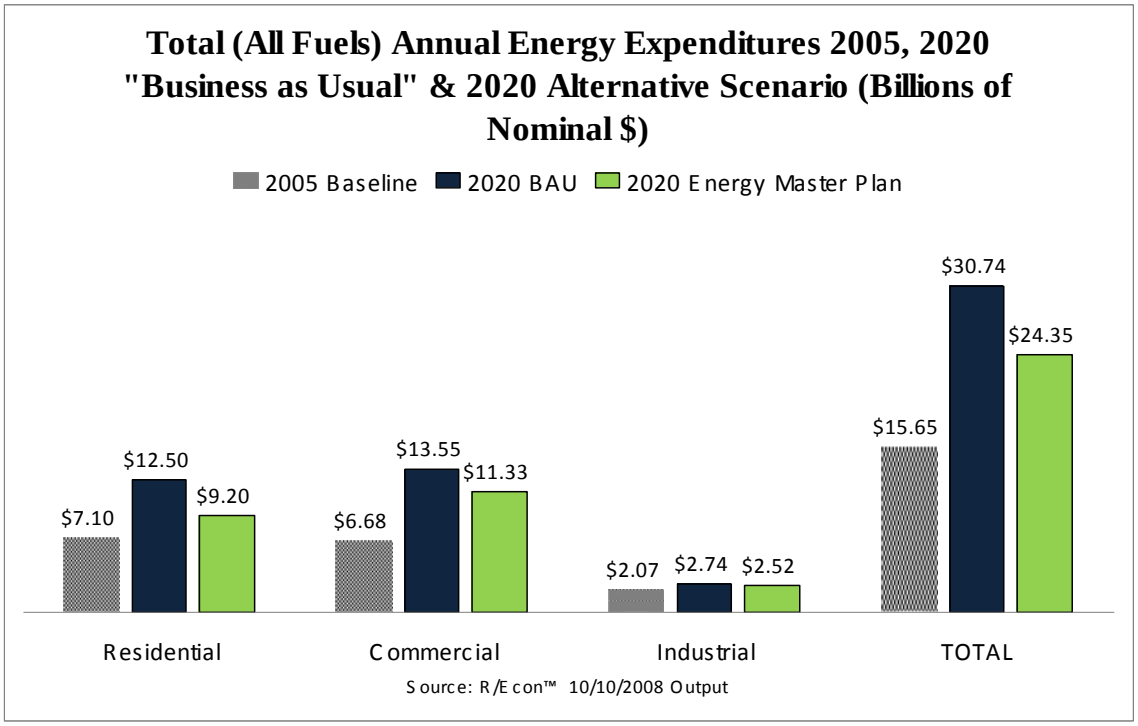

Figure 19: Total Annual Energy Expenditures for all Sectors.

CONCLUSION

New Jersey faces serious energy challenges that if not addressed responsibly, will have significant environmental and economic impacts to the State. Growing energy demand, rising energy prices, energy's contribution to global climate change, and the fact that the State has much less authority to meet these challenges then it used to, are all challenges that face New Jersey.

However, New Jersey is also faced with an opportunity to transform its current energy system from one whose flaws threaten to undermine the security of our economy, to one that is responsible, efficient, clean, affordable and reliable. This Energy Master Plan lists a series of goals and action items that will put the State on track to successfully meet the energy challenges facing it, while developing the clean energy industry as a cornerstone of the State's economy.

These goals and action items will effectively result in approximately $30 billion in total energy savings between 2010 and 2020 for its consumers, while stimulating $33 billion worth of investment into the State's energy infrastructure and creating 20,000 jobs by 2015. To supplement these efforts, the State will provide timely and industry recognized training to ensure that these jobs are provided locally, while implementing programs that encourage the growth of clean energy businesses. These efforts will not only stimulate New Jersey's economy, but it will also provide the State with a 21st century energy infrastructure.

The goals and action items for energy efficiency and conservation offer the fastest and cheapest method to meeting the energy challenges facing New Jersey. Policies that encourage demand response measures, continued investment in renewable and alternative energy technologies, and development of combined heat and power units must also be implemented to further meet these challenges.

However, these actions may not be enough to ensure a responsible energy future for the State and its consumers. Even if these goals and action items are fully realized, it is estimated that additional electricity generation may be needed to satisfy electricity demand. Through continued stakeholder processes and the development of a State Energy Council, the State will ensure that the appropriate balance of supply and demand is kept while remaining consistent with the environmental and economic principles of the State.

Together, these goals and action items have the opportunity if fully implemented to reduce the electricity and heating sectors contributions to greenhouse gas emissions, from 84 million metric tons (MMT) in the 2020 "business as usual" scenario, and 80.6 MMT in 2004 to 56.1 MMT in 2020, 23% below the 1990 reduction target. These reductions in greenhouse gas emissions and in energy savings will build the foundation for an environmentally and economically responsible energy environment in New Jersey.