Energy Issues

This chapter describes fuel supply and renewable energy resources in Maryland. While a majority of the electricity generated in Maryland comes from fossil fuel combustion, hydroelectric and other renewables will contribute a larger percentage of the total in coming years. Nuclear power is also a significant component of the state's total generation profile, and may become more prominent nationally.

Fossil Fuel Types and Availability in Maryland

Coal

Maryland's eight coal-fired power plants consumed 11.6 million tons of coal in 2004. Some of this coal is mined in Maryland — in particular, the approximately 680,000 tons per year of Georges Creek coal burned at the AES Warrior Run facility near Cumberland — but the majority of the coal burned in Maryland originates from other states in the Appalachian Basin (see Table 4-1 and Figure 4-1).

Coal reserves in Maryland are located in Garrett and western Allegany Counties in five fields or basins: Georges Creek, Upper Potomac, Lower Youghiogheny, Upper Youghiogheny, and Casselman. These are attributed to the Conemaugh and Allegheny geologic (coal-bearing) formations.

Most of the coal mining production in Maryland has taken place in the Georges Creek Basin, which contains 41 percent of the state's recoverable coal reserves. The Upper Potomac Basin contains 26 percent of the

Figure 4-1
Origin of Coal Burned by Maryland Power Plants (2004)

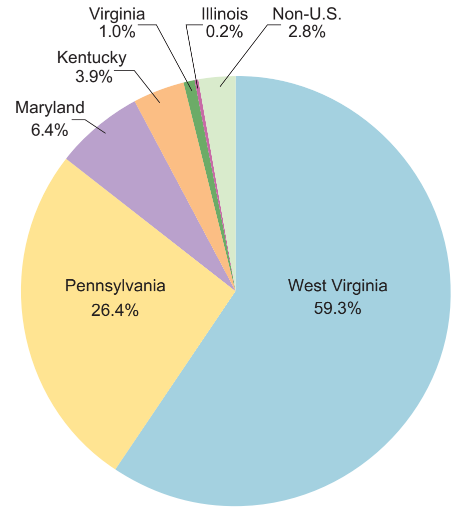


Table 4-1 Coal Burned By Maryland Power Plants in 2004 (in thousand tons)

Origin of Coal	Brandon Shores	H.A. Wagner	C.P. Crane	Dickerson	Chalk Point	Morgan-town	Warrior Run	R. Paul Smith	Total By State	% By State
West Virginia	2,894	1,068	581	1,251	546	572		9	6,921	59.3%
Pennsylvania			111	66	1,075	1,740		84	3,076	26.4%
Maryland							681	71	752	6.4%
Kentucky	339		68		34	12		4	457	3.9%
Venezuela	113	18							131	1.1%
Virginia					51	60			111	1.0%
Poland	56	9	8						73	0.6%
Colombia	67								67	0.6%
Russia	60								60	0.5%
Illinois			18						18	0.2%
Total Coal by Plant	3,529	1,095	786	1,317	1,706	2,384	681	168	11,666	

total coal reserves, followed by 13.6 percent contained in the Casselman Basin. Increasing mining activity is taking place in the Lower Youghiogheny Basin, which contains 12.4 percent of the state's coal reserves. The Upper Youghiogheny Basin represents the smallest coal reserve (7 percent) and mining activities have been minimal.

Maryland's demonstrated reserve base of coal is approximately 678 million tons. Approximately 65 million tons of coal are considered recoverable at producing mines using conventional mining methods with today's technology. There are currently close to 60 active or temporarily inactive mining-related facilities in the state, including underground and surface mining operations. During the 1980s and 1990s, the amount of coal mined in Maryland generally fluctuated between 3 and 4 million tons per year, with the greatest production during that period occurring in 1981 (4.5 millions tons). Since 2000, the tonnage mined has increased slightly and has typically been in the range of 4.6 to 5.1 million tons per year. The majority of Maryland coal is used in metallurgical industries, as well as some power generation, located in other states.

ENERGY POLICY ACT OF 2005:

Clean Coal and Gasification Projects

The Act's Clean Air Coal Program provides incentives to improve environmental performance at existing and new coal-fired plants. Financial assistance is offered in the form of grants and cooperative agreements designed to mitigate financial risks, reduce the cost of clean coal generation, and increase the marketplace acceptance of clean coal generation and pollution control equipment and processes. A second program, the Clean Coal Power Initiative, supports the development of clean coal technologies through a number of incentives (e.g., demonstration and research projects, tax incentives), particularly for coal gasification and clean coal technologies not widely used in commercial applications. Because the bulk of Maryland's electricity generation is coal-fired, these provisions are likely to help Maryland generators position themselves to meet the requirements of the new Clean Air Interstate Regulations (CAIR). Applications for incentives must be submitted within a three-year period from the date of enactment of the Act.

Petroleum

Petroleum consumption in the state of Maryland averages about 12 million gallons each day, with more than half of that amount consumed as transportation (gasoline) fuel. Since there are no crude oil reserves or refineries in the state of Maryland, all supplies of petroleum necessary to meet the state's consumption needs have to be imported. Petroleum is transported via barge to the port of Baltimore and via the Colonial Pipeline. The Colonial Pipeline, a major petroleum products pipeline, traverses the state on its way to New York. Mirant also obtains fuel oil for its Chalk Point and Morgantown plants through its Piney Point terminal in St. Mary's County. Nationwide, about 56 percent of the crude oil and petroleum products used in the United States are imported from other countries.

Several power plants in the state use petroleum products (distillate and residual fuel oil) as either a primary or backup fuel. For those plants with dual fuel (gas/oil) capability, oil can be used as a backup fuel that allows power plants to continue operating when natural gas supplies are interrupted — such as on cold winter days when priority is given to residential heating.

However, a plant's air permit often places severe restrictions on the number of hours that the plant can burn oil, because oil combustion gives rise to a higher level of emissions compared to natural gas. In general, plants that burn oil as a primary fuel are either small and run only during peak demand hours, or were built when oil was cheaper and gas scarcer. Maryland has approximately 2,500 MW of oil-fired (or dual fuel) capacity.

Natural Gas

Natural gas reserves in Maryland are minimal and uneconomical to extract; therefore, virtually all natural gas used in Maryland is imported. In 2003, residential and commercial customers used about 200,000 million cubic feet (Mcf) of natural gas. That level of consumption has been fairly constant since 2000.

Maryland receives bulk natural gas from four pipelines: Transco, Columbia Gas Transmission Corporation, Consolidated Natural Gas Corporation, and Eastern Shore Natural Gas interstate pipelines. Electric utilities consumed about 11,000 Mcf, or about 5 percent of the total natural gas consumed in Maryland in 2003, a decline from approximately 30,000 Mcf consumed in 2000. Although the majority of new generating capacity in Maryland is gas-fired, recent increases in natural gas prices have limited the number of hours that gas-fired units operate.

The cost of this natural gas has increased dramatically over the past several years. Prices for July 2005 deliveries were between $8.00 and $8.50 per million BTU, compared to approximately $3.50 in July 2002 and $2.50 in 2000. The long-term equilibrium price has risen from about $2 per million BTU 8 years ago, to more than $8 now. The reason for this increase is simple: suppliers are finding it increasingly difficult to keep up with demand for natural gas. Over the last decade, demand for natural gas has increased 10 percent. To meet this demand, production comes increasingly from marginal wells — partially because of increased demand and partially because of the depletion of more productive wells.

The increasing prices for natural gas in recent years have moderated growth in demand for natural gas. Total gas consumption in the U.S., and also in Maryland, has remained fairly stable over the past few years. While natural gas use has increased in the residential and commercial sectors, demand in the industrial and electric utility sectors has declined, largely offsetting the residential and commercial demand increases. In 2000, natural gas consumed to generate electricity represented approximately 14 percent of natural gas consumption in Maryland; in 2003, less than 6 percent of natural gas was used for electricity generation. Similarly, as natural gas consumption declined by 45 percent in the industrial sector, residential consumption in Maryland increased by 8 percent and commercial consumption by 27 percent over the period 2000 to 2003. These sector-specific growth rates in natural gas consumption reflect differences in the underlying rates of growth in each of the sectors (i.e., growth in the number of residential customers; growth in commercial and industrial activity), differences in the availability of substitute fuels, and differences in price sensitivity.

The price of electricity depends, in large part, on the price of fuels. While electricity generated from plants fueled by natural gas represents less than 10 percent of generation in the PJM region, gas generation frequently represents the

Cove Point Expansion Project

PPRP and the Maryland Energy Administration (MEA) have intervened in the FERC licensing process that is reviewing the proposed Cove Point expansion, just as the State intervened in 2001 when the LNG facility was first reactivated. As part of its involvement in the evaluation and licensing process, PPRP is sponsoring an independent analysis of risks associated with the proposed facility expansion on the nearby Calvert Cliffs Nuclear Power Plant. PPRP and MEA have also raised questions regarding the impact of additional LNG tanker traffic on local recreational and commercial vessels and fishing interests, as well as economic impacts to the Port of Baltimore that might result from increased tanker traffic and associated restrictions to the shipping channel in the Chesapeake Bay.

Coal Transportation: Rail vs. Barge

The two predominant forms of coal delivery to electric generating facilities are rail and barge. In 2002, rail transportation was relied upon for about two-thirds of coal deliveries and barge transportation accounted for about 11 percent of coal deliveries nationwide. Other modes of transportation include truck and conveyor (for plants at mine mouth locations). The choice of transportation method is based on locational and economic considerations. Barge transportation of coal for plants accessible by waterways can be more economical than rail transportation if the distance to be traveled over water is not too excessive and if handling costs can be contained. Handling costs relate principally to the transfer of the cargo from one mode of transportation to another.

In Maryland, Constellation's Brandon Shores coal-fired generating station is the only power plant now receiving coal by barge. In 2005, Mirant filed an application with the Maryland PSC for approval to construct and operate a coal barge unloading facility at its Morgantown generating station located in Charles County on the tidal portion of the Potomac River. Currently, Morgantown receives coal by rail. Additional deliveries of coal by rail are made to Mirant's Chalk Point generating station in Prince George's County. The proposed Morgantown coal barge unloading facility would be capable of handling 5 million tons of coal per year, which represents the maximum combined consumption of the Morgantown and Chalk Point generating stations.* With construction of the proposed facility, Mirant would have supply and transportation options not currently available to the two generating stations. Constellation is also exploring the option of barge delivery for its C.P. Crane power plant, located on a Chesapeake Bay inlet in Baltimore County.

* Chalk Point is anticipated to be served via rail transportation from Morgantown, where the coal to be used by Chalk Point would be off-loaded from barges and transferred to rail carrier.

ENERGY POLICY ACT OF 2005:

LNG Facility Siting

The Act amends the Natural Gas Act of 1938 and grants FERC the exclusive authority to approve or deny the siting, construction, expansion, and operation of LNG terminals. The governor of the state in which the proposed LNG terminal is to be located is able to designate appropriate state agencies to consult with FERC regarding state and local safety considerations. Among other things, those safety considerations could include the existing and projected population and demographic characteristics of the location and the natural and physical aspects of the location. Some state authority will continue to exist through other federal statutes that may allow states an opportunity to authorize or block the development of an LNG facility. Specifically, the Coastal Zone Management Act, Clean Water Act, and Clean Air Act include regulations under which a state could deny the issuing of permits for construction and operation of an LNG facility.

marginal generation resource, and, consequently, has a disproportionately large impact on market prices. This is particularly the case during periods of relatively high electric power demand, for example, during peak times of the day in summer and winter months.

The federal government expects the demand for natural gas to grow by 50 percent over the next 25 years. More than half of the recently built electricity generation capacity in the U.S. is fueled by natural gas. The number of residential natural gas customers is also increasing. According to the U.S. Geological Survey, there are still enough recoverable gas reserves left in the country to last for decades. Almost 60 percent of those reserves, though, are on federal land, and 40 percent are on federal land where development is restricted or prohibited.

Recognizing these natural gas market conditions, a number of energy companies are working to develop new facilities for the importation of liquefied natural gas (LNG). In Maryland, the Cove Point facility began accepting new deliveries of LNG in the late summer of 2003 and recently filed an application with FERC to nearly double the capacity of the facility (see sidebar on page 4-3). Development of new receiving ports will allow domestic markets to access additional supplies of natural gas from other parts of the world. The capability to import LNG expands the potential sources of supply, which would otherwise be limited to reserves in the United States and Canada.

Natural gas storage is another component of the supply system that provides flexibility in meeting variable demand and helps maintain consistency in prices. Interstate gas suppliers operate storage areas, usually in depleted production fields, where natural gas can be accumulated during low demand periods and released during high demand periods. Maryland has one such storage area, Accident Dome in Garrett County, and other potentially suitable sites may exist in Western Maryland.

It is possible that expansion in the amount of natural gas-fired generating capacity, along with growth in other sources of demand, will result in the need for increased gas pipeline capacity within Maryland and the region. Traditionally, pipeline construction has not been a problem when the demand is demonstrated. Energy companies will not invest in, nor will FERC permit, new pipelines until it is clear that demand will materialize. The developer usually demonstrates demand through a successful open season (preliminary auction) for capacity.

Synthetic Fuel

Synthetic fuels can be either gaseous or liquid and are most commonly formed from coal, shale, or biomass resources such as crop residue or animal wastes. There are four proven processes through which synthetic fuels (or synfuels) are made: synthesis, carbonation, extraction, and hydronation. The most widely used synfuel process, Fischer-Tropsch synthesis, originated in Germany in 1920. Fischer-Tropsch has been used extensively in South Africa to convert coal to diesel fuel when oil was not available during its isolation under apartheid. There are two companies with commercialized Fischer-Tropsch processes. Sasol Chemical produces most of South Africa's diesel fuel from coal-based Fischer-

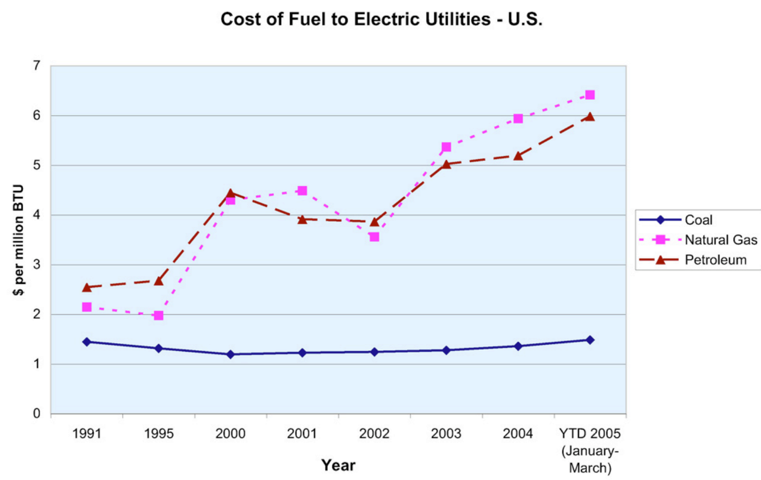
Tropsch facilities. Shell's Bintulu, Malaysia, facility uses natural gas as a feedstock, and produces primarily low sulfur diesel fuels.

Environmental considerations and an increasing demand for low sulfur fuels for motor vehicles has generated new interest in synfuels. Although the synfuel process is an established technology that is already applied on a large scale, high capital costs, high operation and maintenance costs, and the relatively low historical price of crude oil have hampered the construction of new facilities. The use of natural gas as a feedstock, for example, only becomes practical when using "stranded gas." Stranded gas includes sources of natural gas which are impractical to access with conventional gas pipelines and LNG technology because of their distance from major cities. Stranded gas reserves are most commonly associated with oil exploration and production facilities located in remote areas of the world. There are several companies developing the process to enable practical use of so-called stranded gas reserves. Furthermore, the U.S. Department of Energy is investing millions of dollars in coal gasification and synfuel technologies as part of the FutureGen project to develop an emissions-free power plant (see further discussion on page 3-23).

Fuel Prices

Over the past several years, the price of fuel has increased significantly due to national and global market changes. Fuel price increases, however, have not been uniform across fuel types. The figures below show the cost of fuel (coal, natural gas, and petroleum products) to electric utilities (national) since 1991.

Despite small fluctuations, coal prices have generally remained the same since 1991. Both natural gas and petroleum prices have increased and by early 2005 were significantly above 1991 levels. Natural gas prices in early 2005 were three times the 1991 levels, and petroleum prices were over twice the 1991 levels. The extent to which fuel costs to electric utilities will change over the coming years is highly uncertain. U.S. Department of Energy fuel price projections for 2010 indicate declines from 2005 (in nominal dollars) of 15 to 20 percent for petroleum and natural gas. Coal prices are projected to decline by approximately 5 percent by 2010.



It is possible to create synfuels from biomass resources as well as fossil fuels. Through pyrolysis or gasification, waste or biomass resources are degraded or broken down in a controlled environment producing a synthetic gas that can be cleaned and blended with natural gas. This blend of synthetic and natural gas can then be used as fuel for power plants. The barrier to wide-scale use of pyrolysis or gasification of biomass resources is, again, capital costs.

The U.S. government provides tax credits for the production and sale of synthetic fuel. The legislation was originally enacted in 1980 and the synfuel tax credits will expire in December 2007. Under this statute, companies selling coal that is sprayed or coated with substances from bio-diesel, starch, latex, or pine tar qualify for the tax credit, even though these are not technically synthetic fuels as they are traditionally defined.

The Maryland PSC has granted approval to test burn spray-on coal "synthetic fuel" at four Maryland generating stations: Constellation's Brandon Shores, H.A. Wagner, and C.P. Crane plants, and Mirant's Chalk Point facility. Brandon Shores, Wagner, and Chalk Point completed test burns using coal sprayed with a polymer-based latex and provided statistical analyses to the PSC showing that the use of synthetic fuel did not increase air pollutant emissions. Crane has yet to complete a test burn of synthetic fuel.

Based on these results, the PSC granted the use of spray-on coal at Chalk Point, Wagner, and Brandon Shores. Chalk Point continues to operate using this synthetic fuel. However, with the expiration of the tax credit in 2007, it is possible that Chalk Point may discontinue use of the spray-on coal.

Nuclear Power

Similar to power plants fueled by fossil fuels, the turbines and generators of nuclear power stations are driven by the steam produced from heat; in the case of nuclear power, the heat is generated as a result of the fissioning of uranium atoms. However, unlike the burning of fossil fuels, this form of heat generation does not create potentially harmful greenhouse gases, although it raises other important issues. Maryland has one nuclear-powered facility, the Calvert Cliffs Nuclear Power Plant with a capacity of 1,829 MW that generates more than one-fourth of the state's electricity.

Uranium

There are no uranium reserves in the state of Maryland. Although operators of U.S. nuclear power reactors do purchase uranium fuel produced from U.S. sources, the bulk comes from foreign suppliers. Uranium inventories from the dismantling of nuclear weapons have become an increasingly important supply source as well.

Before raw uranium ore can be used in nuclear power reactors, it needs to be first converted into uranium hexafluoride and then enriched to increase the proportion of the fissionable and usable main component. The United States Enrichment Corporation operates the only uranium enrichment facility in the U.S., and is the world's leading supplier of enriched uranium fuel for commercial nuclear power plants worldwide. Enriched uranium fuel is then converted into uranium dioxide powder and pressed into fuel pellets. These are loaded into long tubes, or fuel rods, and are grouped together into a bundle, or fuel assembly, that is designed to meet the specific requirements of each nuclear reactor. Three U.S. companies produce this final form of uranium fuel and collectively meet the U.S. market demand.

Uranium fuel assemblies are commonly transported by truck in packages specially constructed to protect them from damage during transport and to minimize the risk of an unwanted fission reaction that could result in a radioactive release. Packages are designed to retain their integrity in various conditions such as fire, impact, immersion, pressure, heat, and cold. Fuel assemblies have a low radioactivity level and radiation shielding is not necessary. The handling, transport, and storage of these materials are strictly regulated and controlled by the NRC and the U.S. Department of Transportation.

The efficiency of the reactor's chain reaction begins to decrease after 36 to 54 months of use, when fuel assemblies need to be replaced. Every 18 to 24 months, about one-quarter to one-third of the fuel assemblies are removed from the reactor and replaced with new fuel. The quantity of fuel assemblies necessary for the annual operation of a reactor is normally supplied in one consignment occupying 6 to 7 trucks.

Nuclear Energy Generation

Because nuclear power plants do not burn anything to generate electricity, they have very low emissions of particulates, NO_x, and SO_2, and emit virtually no carbon dioxide or other greenhouse gases. However, although nuclear power plants do not produce emissions when they are generating electricity, certain processes used to create and fuel the plants do. These include construction of the plant, mining and processing of the fuel, non-nuclear operation of the plant, the disposal of used fuel and other waste by-products, and the decommissioning of the plant.

The handling of waste products is a significant issue for nuclear generation. In the past two decades, the waste problem has become less acute as the average volume of waste generated at nuclear power plants has decreased significantly thanks to improved process efficiencies. Currently, U.S. nuclear power plants generate about 2,000 tons of waste annually. During its 40-year existence, the U.S. nuclear energy industry has generated a total of about 40,000 tons of radioactive material in the form of used fuel rods. If stacked together, these would fill a football field to a depth of five yards. All used nuclear fuel is managed and stored at plant sites under strict containment and monitoring requirements. (See the Radiological Impacts section, starting on page 3-71, for a more extensive discussion of radioactive waste.)

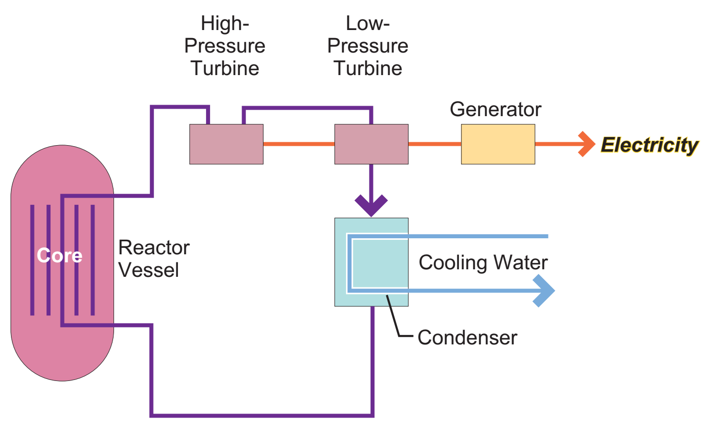
Nuclear reactor designs in commercial use in the U.S. were developed in the 1970s, and fall into two categories: pressurized water reactors (PWRs) and boiling water reactors (BWRs). Collectively known as light water reactors, these two designs are often grouped together because both make use of ordinary "light" water to generate energy through steam turbines. In PWRs, as the two in use at the Calvert Cliffs Nuclear Power Plant, electricity is generated as follows: the reactor core creates heat, which is carried to the steam generator by pressurized-water in a primary coolant loop (see sidebar). The steam generator then vaporizes the water in a secondary loop, driving the turbine that produces electricity. At no time does the secondary loop enter the reactor vessel.

Nuclear Reactors

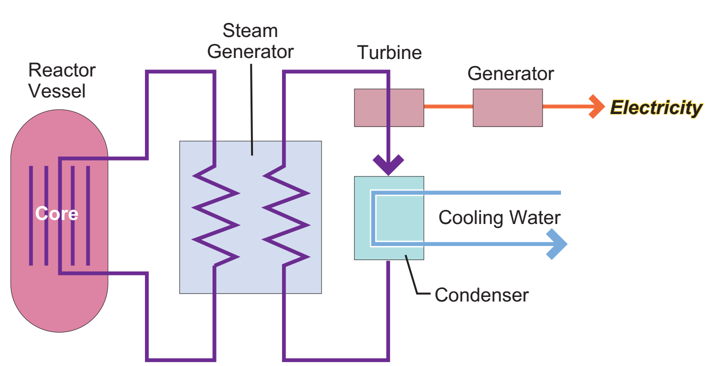
All currently operating commercial nuclear power reactors in the United States are one of two types — boiling water reactors (BWRs) or pressurized water reactors (PWRs). In each, steam directly or indirectly created by heating water in the nuclear reactor core drives a turbine.

In a BWR, water circulated through the core is heated to produce steam. In a PWR, water under pressure and super-heated in the reactor core provides the heat to convert a secondary loop of water to steam.

Boiling Water Reactor



Pressurized Water Reactor



ENERGY POLICY ACT OF 2005:

Implications for Nuclear Energy

The Act includes provisions for federal risk insurance and extension of liability protection through 2025 for owners of nuclear power plants, and for enhanced security measures associated with the operation of nuclear facilities. The Act authorizes funds for research, development, and demonstration of advanced nuclear energy technologies. Nuclear power plant developers can receive an $18 per MWh production tax credit for up to 6,000 MW of new nuclear facilities for the first eight years of a plant's operation beginning on the date the facility is placed in service.

At the Peach Bottom Atomic Power Station, two BWRs are used, and electricity is also generated from turbines that are driven by steam. In this design, a single loop delivers to the turbines both the heat-generated steam that is created by the reactor core, and returns to the reactor core the water necessary to cool it. Electrically powered pumps force-circulate the cooling water.

Reactor technology has significantly evolved since the 1970s to better meet commercial and safety criteria. Before any new reactor design can be built in the U.S., it has to be certified by the NRC in order to resolve design issues prior to construction and reduce site development time. Three new reactor designs-referred to as advanced light water reactors-incorporate more advanced safety concepts than previous reactor technologies and have been certified by the NRC. Other designs such as General Electric's Economic Simplified, Boiling Water Reactor are in the pre-certification stage.

According to data collected by the Nuclear Energy Institute, nuclear power generating facilities in the U.S. produced electricity at an average cost of 1.68 cents per kilowatt-hour in 2004, compared to 1.9 cents/kWh for coal-fired plants, 5.39 cents/kWh for oil-fired plants, and 5.87 cents/kWh for natural gas-fired plants. While nuclear energy generates electricity at relatively lower average cost/kWh and emits less harmful gases than fossil fuel-generated alternatives, its drawbacks include uncertain options for the disposal of radioactive waste, high upfront costs for the initial set up and construction of nuclear power plants, and a lengthy regulatory approval process. Nuclear waste generated by reactors remains radioactive for many thousands of years. Currently, no permanent way of disposing of this waste exists and it is stockpiled on site at nuclear power plants. The construction of nuclear plants has been and continues to be subsidized by the government in the form of tax breaks and other incentives. Obtaining regulatory approval for the construction of new nuclear plants, in particular for new reactor designs, remains a lengthy and costly process, even in light of recent revisions to the regulatory licensing process.

Renewable Energy

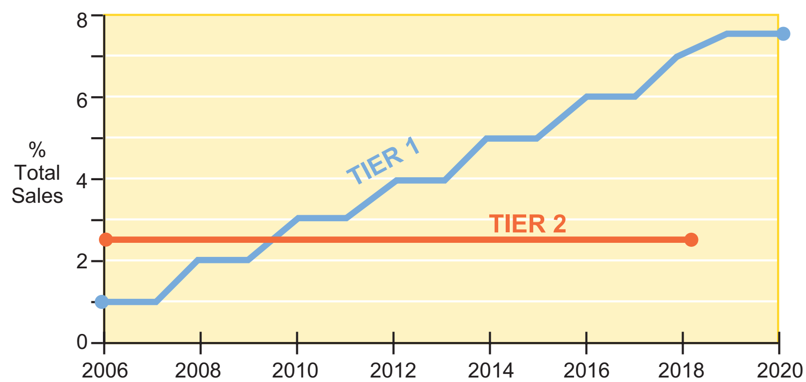
There is growing interest in Maryland to encourage the use of renewable resources for generating electricity. Renewable energy resources are generally cleaner than conventional fossil fuel generating technologies, may diversify Maryland's fuel mix, and in some cases contribute to local economic development.

Renewable Energy Portfolio Standard

On May 26, 2004, Governor Robert L. Ehrlich signed into law S.B. 869/H.B. 1308 creating a renewable energy portfolio standard (RPS) as well as a Maryland renewable energy fund. Pennsylvania and the District of Columbia also enacted RPS policies in 2004, joining New Jersey, which adopted an RPS in 1999 and significantly revamped it in 2004. In all, 20 states (including the District of Columbia) have RPS policies in place.

Figure 4-2 summarizes the requirements of Maryland's RPS. Electricity suppliers must submit information related to their sales of Tier 1 and Tier 2 sources to the Maryland PSC to demonstrate compliance. The PSC is designated as the implementing authority and is charged with ensuring that suppliers are meeting the RPS requirements. If a supplier does not provide the required amount of renewable electricity to their customers, it must pay 2 cents for each kilowatt-hour short of its required renewable sales of Tier 1 resources (in other words, $20 per MWh) and 1.5 cents for every kWh short of Tier 2 resources ($15 per MWh).* The revenues collected through non-compliance fees will accumulate into a new fund, the Maryland Renewable Energy Fund, which will be managed by the Maryland Energy Administration. The fund will be used to provide grants and loans for new renewable energy generation projects in Maryland.

Figure 4-2
Maryland RPS Summary



The Maryland law requires that a portion of all retail sales of electricity in Maryland come from renewable resources and defines eligible resources according to two categories, Tier 1 and Tier 2.

Tier 1 renewable resources are defined as fuel cells that produce electricity from other Tier 1 resources, geothermal, hydro facilities under 30 MW, methane, ocean, qualifying biomass, solar, and wind.

Tier 2 resources include municipal waste-to-energy projects, poultry litter, and existing hydro facilities over 30 MW. Tier 1 resources can be used to meet the 2.5 percent Tier 2 standard.

As is typical with many other state RPS policies, the mid-Atlantic state RPS policies will rely on the selling and trading of renewable energy certificates (RECs) as a compliance mechanism and as a means of minimizing the above-market costs of renewable energy technologies. RECs represent the non-energy attributes of renewable energy, and can be viewed as the incremental cost for renewable energy resources. In mid-2005, the estimated price for RECs from facilities eligible as Tier 1 renewable resources in Maryland was $1.75 per MWh, well under the non-compliance fee of $20 per MWh, thus encouraging the development of new renewable capacity.

Tier 1 and Tier 2 renewable electricity generators are required to register facilities for RPS eligibility with the PSC. In most instances, the certification process is straightforward. Facilities self-designate as either a Tier 1 or Tier 2 renewable resource and provide an attestation that the applicant is in compliance with relevant environmental and administrative requirements.

Once certified, facilities will register with the PJM's Generator Attribute Tracking System (PJM-GATS). PJM-GATS is designed to track the environmental attributes of generation, and support reporting, compliance, and verification requirements consistent with the regional renewable portfolio standards in neighboring states and other environmental markets. Registered PJM-GATS users with facilities tied into the PJM system receive RECs associated with generation as accounted for in the PJM market settlements data at the end of each month. The

* Industrial customers, defined as those manufacturing firms within the North American Industry Classification System Codes 31-33, pay a lower non-compliance fee of 0.8 cents per kWh in 2006, decreasing to 0.2 cents by 2017.

RECs will provide emissions data as well as fuel information and eligibility for state polices such as the RPS.

There are two scenarios under which an electricity supplier is not required to provide RECs in proportion to the sales of electricity to its customers. Under the first scenario, industrial customers who consume more than 300 million kWh per year are exempt from purchasing renewable energy or RECs for all electricity sales above the 300 million kWh ceiling. This provision of the statute effectively caps the renewable energy requirements for very large customers, of which there are only a few in the state. The second scenario is in the case of extreme economic hardship. The PSC will review economic hardship applications from consumers on a case-by-case basis. If granted, electricity suppliers do not have to procure renewable energy or RECs for those customers for one year, consequently lowering the electricity bills to customers suffering economic hardship by the additional cost of the renewable energy or REC.

Renewable Resources in Maryland

Renewable energy is defined as energy that is obtained from sources that are essentially inexhaustible. The Maryland Renewable Energy Portfolio Standard includes solar, wind, qualifying biomass (wood, waste and residues, and agricultural products), landfill methane, waste-to-energy, and hydroelectric power in its definition of renewable energy. Geothermal and ocean resources are also included within the description, but there are no geothermal resources in the Mid-Atlantic that can support electricity generation, short of very deep drilling that is currently not economically feasible. In addition, while there are some conceptual research and development experiments, and prototypes on wave power in California, Oregon, Maine, and Washington, commercial ocean power development is not likely to occur in the near term. For these reasons, neither geothermal nor ocean resources are discussed in this section.

Presently, about five percent of the electric generating capacity in Maryland comes from renewable resources with about 570 MW of hydroelectric power, 148 MW of biomass capacity (including waste-to-energy, landfill gas, and wood firing), and 0.4 MW of solar photovoltaics (comprised of small on-site generation systems). The sections below provide a description of the renewable resources available in Maryland and various policies to encourage their further development.

Hydroelectric Power

Maryland has approximately 570 MW of installed capacity from hydroelectric power plants. The largest is the Conowingo Dam owned by the Exelon subsidiary Susquehanna Power Corporation with a generating capacity of 549.5 MW. The Conowingo Dam on the Susquehanna River impounds 105 billion gallons of water in a 14 square mile lake. The next largest hydroelectric facility is Deep Creek power station, a 20 MW facility located on the Youghiogheny River. Reliant Energy sold the Deep Creek facility to Brascan Power in 2005. There are a handful of other

ENERGY POLICY ACT OF 2005:

Hydroelectric Licensing Process

The Act contains provisions that affect the licensing process of hydropower projects. Hydropower project licensees can offer cost- or power-saving alternatives to mandatory conditions (e.g., fishways) imposed by federal resource agencies to protect the environment as long as these alternatives are no less protective than initially prescribed mandatory conditions. Implications for the State of Maryland are that it might have to take a more proactive role in imposing a desirable condition for environmental protection if a federal agency were unable to do so. Other provisions of the Act provide incentives to install additional or new hydropower turbines at existing dams in Maryland. However, this is not likely to significantly impact the environment since installation of new turbines may be more beneficial than existing ones. The Act also considers increased hydroelectric generation at existing federally-owned or operated facilities. In Maryland, Jennings-Randolph Dam and Savage Dam, which were previously considered not financially viable for hydroelectric generation, could become potential candidates for hydropower projects.

small hydropower facilities in Maryland including two dams on the Potomac River, totaling 4 MW, and Brighton Dam, a 400 kW facility in Howard County (see discussion on page 3-45).

It is unlikely that additional hydropower projects will be developed in Maryland. It has been more than 80 years since the construction of the Conowingo Dam, and the environmental and economic impacts associated with new dam construction would make it difficult to license and permit a new facility. However, an assessment conducted by the Idaho National Engineering and Environmental Laboratory of the U.S. Department of Energy in 1998 identified 35 potential sites in Maryland for future hydropower facilities. Most of the sites are dams constructed to create reservoirs or old facilities once used for milling that could be repowered. Thirty-two of the sites identified in the assessment have some type of developed impoundment or diversion structure in place, but do not have any hydropower generating capabilities. The assessment estimates that these existing facilities could be developed for 9 MW of additional hydroelectric capacity in Maryland. Three undeveloped sites are also identified as possible micro-hydropower facilities for a combined 1 MW of additional capacity. The 35 sites are located within nine major river basins with one site in each of the Bush, Choptank, Gunpowder, Wicomico, and Youghiogheny Rivers; two sites on the Patuxent River; three sites on the Susquehanna River; five sites on the Patapsco River; and twenty potential sites on the Potomac River.

Biomass

Biomass energy is derived from three distinct energy sources: wood, waste, and alcohol fuels. Biomass resources typically include plant or plant-derived materials, such as trees, grasses, wood, agricultural crops, aquatic plants, and residues from the agriculture and forest industries. Additionally, biomass can include animal wastes and wastes produced by cities and factories. Some of the best opportunities for use of biomass fuels in Maryland include electricity generation from poultry litter, wood residues, and cofiring biomass with coal. Municipal solid waste and landfill gas are already being used as biomass fuel sources in Maryland (see discussion on page 4-13).

Poultry Litter

Poultry litter consists of the waste and bedding material found in chicken houses. The Renewable Energy Interagency Working Group, established by Governor Robert L. Ehrlich to evaluate the potential applications for renewable energy technologies in Maryland, has recommended that a power plant fueled by poultry litter be considered for development on Maryland’s Eastern Shore.

In 2001, PPRP completed a feasibility study evaluating the use of poultry litter to replace wood as the fuel used at Eastern Correctional Institution's (ECI's) cogeneration facility. PPRP has estimated that approximately 80 to 90 poultry farms would be required to supply enough litter to fuel the ECI power plant, which has an electricity output of approximately 5 MW as well as producing steam for the site. Based on information from the Maryland Department of Agriculture, there are more than a thousand poultry farms in the lower Eastern Shore of Maryland. The logistics and expense of collecting and transporting the litter to a poultry litter-fired power plant would be one of the primary feasibility challenges in developing such a facility.

Developing a poultry litter-fired power plant would accomplish two goals: It would make use of a renewable energy resource and help to reduce nutrient runoff. To further explore this concept, the Maryland Environmental Service, along with the Maryland Energy Administration, is planning to evaluate the potential for a poultry-litter fired power plant in Maryland. There is one poultry litter power plant, which will be the first power plant fueled by poultry litter in the U.S., under construction in Minnesota and scheduled to come on line in early 2007. Three poultry litter power plants are operating in the United Kingdom (Eye, Thetford, and Westfield) and one is under development in Japan. A fourth U.K. facility, Glanford, was previously in operation but has been diverted for use as part of that country's strategy to dispose of cattle exposed to mad cow disease.

Wood Fuels

There are two wood-fired power projects in Maryland. ECI has a 5 MW wood-fired cogeneration project in Princess Anne that combusts about 50,000 tons of wood chips annually. Besides electricity, the cogeneration project also provides steam for the prison. Dorchester Lumber Company in Linkwood has a small generator (about 500 kW) at its sawmill, and sells any available excess power to its local utility. Nationally, there are about 7,200 MW of wood residue projects. The market for wood residue projects slowed down considerably after fewer above-market-price power purchase contracts became available under the Public Utility Regulatory Policies Act of 1978. As a result, there have been few wood residue plants built in the mid-Atlantic region in recent years, with the last one built in 1988. Wood residue projects are relatively high-cost compared to alternative electric power generation projects because of the higher costs of procuring and transporting wood fuel. In addition, there are some concerns over air emissions from wood residues, although with the use of advanced technologies such as fluidized bed systems, wood residue projects should be able to meet Clean Air Act standards.

Biomass Co-firing

There is one biomass cofiring facility operating in Maryland. New Page operates a 60 MW facility for self-generation as part of its facility located in Luke, Maryland. Approximately three percent of the total amount of energy resources consumed by the Luke Mill’s two electric generators is from biomass, specifically black liquor, which is a wood residue generated in the pulp and paper manufacturing process.

Cofiring biomass in coal-fired electric generating facilities may be an option for some of Maryland’s older coal-fired power plants. When cofiring less than two percent biomass based on total heat input, the biomass and coal can be blended and pulverized together, reducing the need for extensive retrofits to existing coal facilities. Research and experience demonstrate that cofiring greater than two percent biomass will require the development of a separate fuel processing and injection system. Injecting biomass separately into the boiler can allow for higher biomass percentages — up to 15 percent on a heat input basis (about 30 percent by mass). However, separate biomass injection requires separate fuel handling equipment and fuel preparation, adding to plant capital and operating costs.

The environmental benefits of cofiring, including reductions in SO_2, CO_2, and mercury, may make biomass cofiring attractive for some aging Maryland coal facilities. Reductions of NO_x emissions are also possible through cofiring but are less significant than with other pollutants. Additionally, the added economic benefits provided through federal and state tax credits, along with renewable energy credits issued under regional renewable portfolio standards, may encourage Maryland power plants to evaluate the opportunity for cofiring. The high cost of biomass fuels and the operational problems related to the alkali content of biomass fuels, however, limit the application of biomass cofiring in Maryland. The high alkali content in biomass fuels may decrease the effectiveness of certain emissions control technologies such as selective catalytic reduction.

Waste-to-Energy

The waste-to-energy (WTE) industry emerged in the 1970s from corresponding needs to dispose of large amounts of refuse, to close unregulated open dumps, and to develop alternative energy resources after oil price shocks. Maryland has two large WTE power plants (Montgomery County and Baltimore City) that together represent about 130 MW of capacity. The Montgomery County facility handles an average of 1,500 tons of municipal solid waste per day and can generate up to 68 MW. The BRESCO facility in Baltimore processes up to 2,250 tons of municipal solid waste a day and can generate up to 65 MW. WTE power plants can provide environmental benefits by combusting waste rather than relying on landfills, which would otherwise release methane and other greenhouse gases. However, local opposition to WTE plants has grown because of concern over air emissions (e.g., dioxins) and because of increasing interest in encouraging more recycling. Furthermore, in 1994 the Supreme Court struck down state and local "flow control" laws that directed waste to a designated site, often to waste-to-energy facilities. Flow control provisions were important in ensuring a steady volume of waste for waste-to-energy facilities, and the Supreme Court ruling left states and municipalities with less ability to control waste (and the accompanying revenues from tipping fees) and to finance new waste-to-energy facilities. For these reasons, as well as generally declining energy prices until recently, waste-to-energy development has slowed considerably in recent years.

Landfill Methane

Many landfills operate flares to combust collected landfill gas (LFG). However, changes in engine technology, deregulation of Maryland's power industry, and the availability of tax credits and renewable energy credits for gas-to-energy systems have made alternatives to flares attractive. Economics can favor installation of engines fueled by collected LFG to generate power, which can be used on-site or sold in the deregulated market.

Maryland currently has two operating LFG projects generating electricity. The Gude Landfill in Montgomery County uses LFG to provide 3 MW of capacity while the Brown Station Road Landfill in Prince George's County has 6 MW of capacity fueled by LFG. Two additional LFG projects are under development. Eastern Landfill Gas, LLC, a subsidiary of Pepco Energy Services, is expected to receive a CPCN for a 4 MW LFG energy facility at the Eastern Sanitary Landfill in Baltimore County. Industrial Power Generating Corporation (INGENCO) filed a CPCN application in August 2005, proposing the development of a 6 MW LFG project at the Newland Park Landfill in Wicomico County.

LFG projects are perhaps the most market-competitive of all the renewable energy technologies, especially in light of recent increases of natural gas prices.

Because of this, LFG is a popular renewable energy source for green power marketers. LFG projects offer multiple environmental benefits, such as minimizing greenhouse gas emissions by combusting the methane gas instead of flaring it, and reducing volatile organic compound (VOC) emissions that are contributors to the formation of ground-level ozone. However, LFG systems do emit other air pollutants, such as NO_x, CO, SO_x, and particulates.

A study conducted by the EPA Landfill Methane Outreach Program in 1999 analyzed Maryland landfills according to their potential for LFG development. Landfills with greater than 1 million tons of municipal solid waste in place are considered candidate landfills. At the time of the study, EPA identified 13 candidate landfills, including the Gude landfill that has since been expanded. Four of the candidate facilities are identified as already having LFG collection equipment installed, two of which include the Mountainview Landfill in Allegany County, and the Resh Road II Landfill in Washington County. The Sandy Hill Landfill in Prince George's County is identified as a candidate but has recently entered into an agreement with the federal government for use of the LFG at the NASA Goddard Space Flight Center, as discussed in Chapter 3 under the section on biogas. The Oaks Landfill in Montgomery County is also identified as a potential candidate; however an initial attempt to develop an LFG facility at the site was not successful. EPA estimates that the 13 candidate landfills could provide approximately 523 million BTUs of gas, supporting a total of 52 MW of electric generating capacity.

Solar Energy Grant Program

Senate Bill 485 of the 2004 General Assembly formally established the Solar Energy Grant Program, effective January 2005. The Maryland Energy Administration manages the program, which provides funding for a portion of the costs to install qualifying solar energy systems. Grants are available for up to 20 percent of system costs with a maximum amount of $2,000 for residential solar hot water systems, $3,000 for residential photovoltaic systems, and $5,000 for non-residential photovoltaic property. More than 45 solar grants were approved within the first four months of the Solar Grant Program in 2005. Funding for 2005 is exhausted but will be replenished for 2006.

Solar

The cost of generating electricity with solar photovoltaic systems is approximately $180 to $400 per MWh. This makes solar one of the most expensive sources of electricity in the state. As a consequence, federal and/or state incentives are often required to overcome the high "first cost" of solar energy systems in grid-connected applications. However, solar energy systems can also be used in non-grid applications, such as remote power and battery charging. These applications have provided a small but growing market for solar energy companies and have allowed companies to reduce costs by increasing volume.

The New Jersey renewable portfolio standard (RPS) requires electricity suppliers to purchase solar renewable energy certificates (SREC) or pay a fee of $300 for every MWh they are short of the required amount of SRECs. By 2009, the New Jersey RPS will require an estimated 90 MW of installed solar capacity in order to meet the RPS requirement. In mid-2005, SRECs were trading for $170 per MWh. Similarly, the District of Columbia's RPS requires electricity suppliers to use solar power for 0.005 percent of total electricity sales in 2007 (about 600 MWh), increasing to 0.386 percent (about 64,000 MWh) by 2022. The D.C. law also establishes a non-compliance fee of $300 per MWh of shortfall from the solar energy requirement. The incentives will encourage the development of solar photovoltaic installations in New Jersey and D.C., but are not likely to have a large influence on the Maryland market. The Maryland RPS provides double credit for SRECs; however, alternative renewable energy resources such as wind, biomass, and hydroelectric are still more economic than solar, even with double credit. Furthermore, solar installations in Maryland are not eligible for compliance with the New Jersey or D.C. RPSs.

Wind Power

Wind resources for electricity generation are categorized into "resource classes," with Class 1 being the lowest (wind speeds of between 9 and 12 mph) and Class 7 being the highest (wind speeds of between 21 and 26 mph). Utility-scale wind projects generally require at least Class 4 wind resources (13.4 mph and higher). The best land-based wind resources in Maryland are Class 4 wind resources, located in the western part of the state, primarily along the ridgeline of the Appalachian Mountains, west of Cumberland. The regions offshore from the Delmarva Peninsula have a combination of Class 4 and Class 5 resources within ten miles of the shoreline. Offshore wind farms can use larger wind turbines with higher rotor speeds to generate as much as 40 to 50 percent more energy than onshore wind projects. However, there are a number of challenges facing the development of offshore wind projects, including the lack of onshore transmission infrastructure, equipment deterioration and corrosion from salt spray; construction of towers and foundations to tolerate high waves and strong ocean currents; construction and maintenance delays because of high seas and hostile weather; and the logistics of transporting people and equipment to and from the offshore site. Public support and acceptance of offshore wind projects is uncertain and may derail some projects under development in New England and Long Island. Thus, while offshore wind projects for Maryland's coastal area have been proposed, wind projects are more likely to be developed in Western Maryland.

The Maryland Public Service Commission issued two CPCNs for wind projects in the spring of 2003. Clipper Windpower received a CPCN in March 2003 for a wind power plant of up to 101 MW of capacity, consisting of up to 67 wind turbines of 1.5 MW each. Since the issuance of the CPCN, wind turbine technology has evolved, and Clipper recently requested a modification of its CPCN to use a new wind turbine design. With the new turbine, the wind project will consist of 40 2.5 MW wind turbines. The turbines would be installed on 241-foot tubular towers on land under easement on Backbone Mountain near the town of Oakland, Maryland. Clipper has not yet started construction. U.S. WindForce plans to erect up to 25 1.5 MW turbines near the town of Lonaconing, for a total capacity of 40 MW. Despite receiving the CPCN for this project in March 2003, U.S. WindForce is not expected to begin construction of their facility in 2005. The lands included in the Savage Mountain wind project site include both closed and active surface coal mines, and construction on the wind turbines is pending completion of mine reclamation activities.

A third CPCN application for a wind power project was filed with the PSC by Synergics Wind Energy in June 2004. Synergics's Roth Rock Windpower Project would use a series of utility-scale wind turbines along a three-mile stretch of Backbone Mountain, southwest of Clipper's proposed wind project. As originally proposed, the 40 MW wind power facility would consist of up to 24 turbines of 1.65 MW nominal capacity each, mounted on freestanding tubular towers. After a number of proceedings regarding the specifics of the project and the potential impacts on wildlife and the surrounding area, Synergics filed a supplemental application with the Commission on June 20, 2005 requesting permission to install fewer but larger wind turbines. Synergics' supplemental application calls for 17 turbines of up to 2.5 MW each.

ENERGY POLICY ACT OF 2005:

Incentives for Renewable Energy

The Act extends the renewable electricity Production Tax Credit (PTC) by two years. Generation projects must be online by December 31, 2007, to qualify for the PTC — $19 per MWh for projects in operation in 2005. Wind, geothermal, open loop biomass, qualified hydropower, and landfill gas projects are eligible for the full value of the PTC. The Act also includes a tax credit for residential solar energy systems. As a result of the extension, there could be additional CPCN application filings for landfill gas and wind projects to be located in Maryland. The Act also establishes a new category of tax credit bonds called Clean Renewable Energy Bonds (CREBs). CREBs may be issued by qualified entities such as counties, municipalities, and electric cooperatives to finance the capital cost of a renewable energy project. In lieu of paying interest to the bondholder, the federal government issues a tax credit.

Throughout the proceedings related to the Clipper, U.S. WindForce, and Synergics projects, a number of issues have arisen regarding wind power impacts on biological resources and on visual quality (see discussion on pages 3-53 and 3-62). In addition to addressing these challenges, wind developers are also facing significant cost increases for wind turbines and related equipment. The high cost of steel, unfavorable monetary exchange rates (most wind turbines are manufactured in Europe), and exceedingly high demand for wind turbines are all contributing to higher costs. Recently announced wind projects in California (Shiloh) and New York (Maple Ridge) show capital costs exceeding $1,500/kW, far higher than the $1,000/kW for wind projects in recent years. Further complicating the financing is the fluctuating nature of state and federal tax support for wind power, which affects not only the wind farm developers, but also equipment manufacturers.

Production Tax Credit

The federal production tax credit originated as part of the Energy Policy Act of 1992 and provides a tax credit of 1.5 cents per kWh of generated electricity, adjusted for inflation. Originally targeted to support electricity generated from wind and closed loop bioenergy resources, the tax credit has been expanded to include open-loop biomass, geothermal, solar, qualifying hydropower,* municipal solid waste, and landfill methane, although at different levels and for different lengths of time, depending on the particular technology. However, the tax credit has been allowed to expire three times over the past five years, with progressively shorter extensions. The most recent extension of the tax credit, which expires at the end of December 2007, came as part of the Energy Policy Act of 2005. The uncertain future of the production tax credit has contributed to a "stop and start" market, especially for wind. Furthermore, the short duration of the most recent extension realistically allows only those projects that have already been permitted to begin operating in time to qualify for the production tax credit. Table 4-2 summarizes the production tax credits established by the Energy Policy Act.

In addition to the Federal Production Tax Credit, Maryland previously offered a state production tax credit for the development of renewable resources. Under the Clean Energy Incentive Act, wind power and qualified biomass generators were eligible for a 0.85-cent per kWh tax credit. Biomass cofired with coal was eligible for a state tax credit of 0.5 cent per kilowatt-hour. Those resources already claiming a federal production tax credit were not eligible. However, the Maryland production tax credit expired December 31, 2004, and efforts to renew the credit did not pass in the 2005 session of the Maryland legislature.

The Maryland Energy Administration entered departmental legislation in the 2005 session of the Maryland General Assembly, extending the provisions of the Clean Energy Incentive Act that provide a State production tax credit. The proposed legislation extended the dates of the Maryland production tax credit to facilities placed in service before January 1, 2013. The bill also eliminated

* Qualifying hydropower includes (1) hydroelectric projects in irrigation canals or ditches that generate less than 5 MW, and (2) the incremental generation from new hydroelectric turbines installed at existing dams, as determined by FERC.

Table 4-2 Production Tax Credits (PTCs) through 2007, by Technology

Technology	Level of PTC per kWh	Availability of PTC (years) for Existing* Projects	Availability of PTC (years) for New Projects
Closed-loop Biomass	1.9¢	10	10
Open-loop Biomass	0.95¢	5	10
Geothermal	1.9¢	5	10
Qualifying Hydropower	0.95¢	5	10
Landfill Methane	0.95¢	5	10
Municipal Solid Waste	0.95¢	5	10
Solar	1.9¢	5	5**
Wind	1.9¢	10	10

* Existing projects are those in service before August 8, 2005.

** In lieu of the PTC, new solar projects are afforded a tax credit equal to 30 percent of capital costs.

the restriction that precluded facilities from receiving both the state and federal production tax credits and expanded qualifying facilities to include electricity generated from waste gas from an agricultural operation and municipal solid waste. The legislation passed both the house and senate roll call votes but there was not enough time remaining in the legislative session to reconcile the amendments that were made to the bill for a final vote.

Green Power Purchases

With the restructuring of the Maryland electric industry, the State initiated a competitive acquisition process for State facilities' power supplies. As part of the procurement process, Maryland included provisions for green power purchases. The motivation for the initial green power purchases came as a response to an Executive Order from then-Governor Parris Glendening in the spring of 2001. Executive Order 01.01.2001.02 provided the following guidance for State green power purchases:

1. *For purposes of this Executive Order, "Green Energy" is defined as energy generated from the wind, solar photovoltaic, solar thermal, biomass, landfill gas, and the combustion of municipal solid waste.*

2. *For the procurement of electricity for use within State owned facilities, the State of Maryland has a goal of six percent to be generated from Green Energy. No more than fifty percent of the total Green Energy procurement shall be derived from the combustion of municipal solid waste.*

3. *In the selection of a power generation contractor chosen through the procurement process, priority consideration should be given to companies that produce green power in Maryland. The chosen contractor shall obtain certification from a State approved accreditation process that the company has met the Green Energy goal.*

The State included a requirement for green power as a component of the State's competitive solicitation for retail power requirements in the Baltimore Gas and Electric Company (BGE) distribution service territory. Accordingly, a request for proposals (RFP) for retail electricity serving State facilities requiring a minimum

ENERGY POLICY ACT OF 2005:

Renewable Energy Purchasing

The Act includes a requirement that the federal government purchase an increasing portion of its power supply from renewable resources: 3 percent in fiscal year 2007, increasing to 7.5 percent in 2013. This does not affect Maryland's Renewable Energy Portfolio Standard nor the Renewable Energy Fund signed into law by Governor Robert L. Ehrlich in 2004.

of six percent from green power sources was issued in the fall of 2001. The RFP established a preference for renewable resources located within the State. Suppliers were asked to provide prices for both the green and conventional power separately and as a bundled rate. As a result of the RFP, the State entered into a contract with Pepco Energy Services, a retail electricity supplier that was already providing electricity to State facilities in the BGE distribution service territory under a previous contract with the State. The 24-month contract, which began July 2002, provided 1.6 billion kilowatt-hours electricity, with six percent coming from green sources, primarily landfill gas and waste-to-energy.

Following the end of the 24-month contract period, the second purchase of green power for Maryland State facilities occurred in the spring of 2004 for electricity supplies in the BGE and PEPCO service territories. The invitation to bid issued in March 2004 specified a range of between two and seven percent of electricity that must come from renewable resources, with a preference for on-grid resources over green tags. The solicitation resulted in two-year contracts for green power that make up approximately 13 percent of the total amount of electricity supplied under the contract. The Department of General Services was able to purchase the green power at no additional cost. The winning bidders were Reliant Energy Solutions, PEPCO Energy Services, Washington Gas Energy Services, and ConEdison Solutions.

Net Metering

As a customer generates electricity in excess of what is being consumed on-site, the electricity flows into the distribution system, effectively spinning the meter backwards and crediting the electricity account for the kilowatt-hours produced — thus the term "net metering." The customer pays for only the net energy supplied in a month. However, should a net metering customer generate more electricity than is consumed over the course of the month, the customer is still responsible for all non-energy related monthly charges and does not receive any payment for the excess electricity generated.

In 1997, Maryland enacted a net metering law for residential customers and schools with qualified solar energy systems up to 80 kW. In May 2004, the Maryland General Assembly passed H.B. 1269, effectively expanding the net metering law to include wind turbines as an eligible technology and extending net metering to commercial facilities. H.B. 1331, passed in 2005, allows eligible biomass-fueled electric generating facilities to receive the benefits of net metering and increases the size of eligible systems to 200 kW, or up to 500 kW on petition to the PSC. The statewide limit on net-metering capacity, 0.2 percent of the State's adjusted peak-load forecast for 1998 (34.72 MW), was unchanged in the 2004 and 2005 legislation.

Maryland's net metering statute requires that utilities must install the meters and offer net metering at no additional charge or increased rate. Customers, whose installations meet all applicable safety and performance standards established by the National Electrical Code, the Institute of Electrical and Electronics Engineers, and Underwriters Laboratories, along with other Maryland PSC requirements, may not be required by utilities to install additional controls, perform or pay for additional tests, or purchase additional liability insurance.

Infrastructure Security

Security of critical infrastructure, including electric power infrastructure, has always been a concern. The terrorist attacks of September 11, 2001, however, served to heighten the sensitivity to the vulnerability of certain types of facilities. Within Maryland, as well as within adjoining states, there exist numerous facilities considered to be vulnerable to acts of terrorism which, if compromised, could have serious and adverse consequences for Maryland citizens and the environment. To begin to address the issue in a consolidated fashion, the Maryland Governor's Office has established a Maryland Homeland Security group, comprised of state and local agencies, and coordinated by the Maryland Emergency Management Administration. The group compiles information on assets potentially vulnerable to terrorist acts and is in the process of developing a statewide plan to respond to potential threats or actual actions. The group provides coordination with all state and local agencies and interacts as necessary with federal agencies, including the Federal Bureau of Investigation.

Along with certain industrial and government facilities, some of Maryland's energy facilities are regarded as potential targets of terrorism. These facilities include power plants; high-voltage transmission lines; and key substations that connect transmission lines, transform voltage levels, and redirect power to different areas of the grid. Each individual facility has established security plans, trained security personnel, and initiated security measures, including technology and surveillance equipment. The level of security in place, however, varies widely, as does the cost of providing it in an increasingly security-conscious environment.

In the case of nuclear power plants such as Calvert Cliffs and Peach Bottom, the Nuclear Regulatory Commission (NRC) has formalized, through federal rulemaking and operating license conditions, requirements which are intended to ensure the highest level of security at these facilities, because these facilities are generally regarded as potential major targets of terrorism. Each elevation in security alert status, as determined to be appropriate by the federal Office of Homeland Security, requires additional costs to provide the incremental manpower and equipment resources necessary to meet the security goals. In addition, safety and security zones surrounding these facilities may be expanded under conditions of higher alert, and result in incremental restrictions on access for the general public.

While the NRC has imposed specific security requirements for all U.S. nuclear power plants, federally mandated specific requirements do not currently exist at fossil-fueled power plants or hydroelectric facilities. In Maryland, as elsewhere in the U.S., facility owners and operators have developed and implemented security plans in response to changes in the alert status.

Transmission line security is more difficult to achieve than power plant security. While power plants are located in a single structure, or group of proximate structures, transmission lines traverse many miles and can stretch across relatively remote areas. Fully securing these facilities from possible sabotage is difficult. The extent to which damage can be inflicted, however, is modest (in comparison to the damage that could be inflicted at other potential targets). Damaged transmission line facilities can generally be repaired, and service restored quickly.

Substations serve to redirect incoming power over high-voltage transmission lines and redirect that power to various parts of the grid. These substations can, if damaged, cause widespread electrical outages of long duration, particularly if large power transformers are damaged. Inventories of such transformers are limited and the lead-time for manufacturing transformers can be many months. Like power plants, fenced or walled perimeters can be established around substations to secure the facilities, but unlike power plants, substations are frequently unmanned with the exception of periodic security personnel surveillance.

The additional security measures being undertaken in response to raised levels of concern impose added costs of operation on the owners of the facilities. In a competitive market where all sellers face comparable increased costs to provide the good or service, the increase in cost tends to be passed on to consumers. In the case of the electric power industry in Maryland, the ability to pass on increased costs to the end user has been constrained. The Maryland distribution companies, for example, entered into restructuring settlement agreements to implement Maryland's restructuring act. The settlement agreements incorporate price freezes on the transmission and distribution of power through the end of the transition period (which varies by utility and by rate class). Under the frozen rates arrangements, the utilities do not have an immediate opportunity to recover the costs associated with heightened security measures. Following the end of the rate freeze periods, the first of which expired in 2004, the distribution utilities have the option to request the PSC to permit them the opportunity to recover such costs as part of an overall revenue requirement.

Power generation is a competitive activity in Maryland, and generation facility owners have the ability to recover the added costs of security only to the same degree that other costs (fuel costs, O&M costs, capital costs) can be recovered via the market. Where generating capacity owners entered into multi-year, fixed-price contracts for the sale of power before September 11th, the additional security costs will not be recoverable until those contracts expire and new contracts are signed. Additional security measures, therefore, come at a cost to the public (and to facility owners) in economic terms.

The public also pays a non-monetary cost through reduced access to properties formerly utilized for public activities. Two important examples of this in Maryland are described below:

- *A Chesapeake Bay Security Zone has been established and enforced by the U.S. Coast Guard, with participation of the Maryland Department of Natural Resources police, near the Calvert Cliffs Nuclear Power Plant and the Cove Point LNG facility in Calvert County. This zone will forbid access by commercial charter and recreational fishing vessels to what was formerly a heavily visited fishing area;*

- *Under conditions of Orange Alert, the operators of the Conowingo Hydroelectric station in Harford County close Fisherman's Park, a popular fishing spot along the western shore below the dam for shad in the spring and rockfish, until the alert status is reduced.*