Fuel Supply Issues

Fuel supplies are an important aspect of a state or a region's overall electricity generation profile. Chapter 2 of this report included a discussion of the types of fuels used to generate electricity in Maryland. In the following sections, we discuss in more detail the sources of fuel used in Maryland and the status of renewable energy resources such as wind and solar. Also included is a description of security-related issues — those related to fuel supply as well as the electric power infrastructure in general — that have gained more prominence as a result of terrorism concerns.

Common Fuel Types and Their Availability in Maryland

Coal

Coal mining in Maryland is confined to Garrett County and the western portion of Allegany County. The Conemaugh and Allegheny geologic (coal-bearing) formations include five major minable fields or basins in the state. These include the Upper Youghiogheny, Lower Youghiogheny, Casselman, Upper Potomac, and Georges Creek. The Georges Creek Basin contains the most recoverable coal reserves in the state, followed by the Upper Potomac and the Casselman. There is no mining in the Upper Youghiogheny field.

Maryland's coal reserves are estimated to exceed 1 billion tons. Approximately 490 million tons of bituminous coal is considered recoverable using conventional mining methods with today's technology. During the 1980s, 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 million tons). Since 1990, the tonnage mined has been stable and has typically been in the range of approximately 3.5 to 4 million tons per year, with maximum production at 4.6 million tons for 2001.

Coal-fired power plants in Maryland consume approximately 10 million tons of bituminous coal annually. Some of this coal is mined in Maryland — in particular, the approximately 400,000 tons per year 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 (Kentucky, Pennsylvania, Virginia, and West Virginia).

Natural Gas

Natural gas reserves in Maryland are minimal and uneconomical to extract; therefore, natural gas is imported into the state. In 2001, about 200,000 million cubic feet of natural gas was used by residential and commercial customers. 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 consume about 20,000 million cubic feet (about 10%) of the total natural gas consumed in Maryland.

The cost of this natural gas has increased dramatically over the last 2 years. Prices for July 2003 deliveries were around $6.50 per million Btu, compared to approximately $3.50 for July 2002 and $2.50 for 2000. The long-term equilibrium price has risen from about $2 per million Btu 6 years ago, to more than $4.50 now. The reason for this increase is simple — suppliers are finding it increasingly difficult to keep up with the growth in demand. Over the last decade, demand for natural gas has increased 19 percent. To meet this demand, production comes more and more from marginal wells. The rate of well depletion is increasing and the volume of gas in storage during the summer of 2003 was 32 percent less than the gas in storage the previous year, and 22 percent less that the average of the previous 5 years.

The outlook for the future is uncertain. The federal government expects the demand for natural gas to grow by 50 percent over the next 25 years. At least 80 percent of recently built electricity generation capacity is fueled by natural

Cove Point Liquefied Natural Gas Facility

The Cove Point Liquefied Natural Gas Facility is located on 1,000 acres in southern Calvert County on the western shore of the Chesapeake Bay just north of the Patuxent River. The facility owners, Dominion Resources, recently received approval from the Federal Energy Regulatory Commission (FERC) to refurbish, expand and reactivate the LNG facility, which began operation in 1978 and ceased LNG import operation in 1980. The U.S. Coast Guard (USCG) has also approved reactivation of the facility subject to establishment of a safety and security zone surrounding LNG carriers and the offshore terminal. On behalf of Maryland agencies, PPRP provided comments and participated in rulemakings before both the FERC and the USCG throughout this two-year process. The primary issue raised and addressed in the FERC process was that of safety and security, particularly given the terminal's proximity to Calvert Cliffs Nuclear Power Plant just 4 miles to the north, and heightened concerns in the aftermath of the events of September 11, 2001.

In its Final Order, the USCG imposed a full-time 500 yard restricted zone around the offshore terminal and any incoming or departing LNG transport vessels. One of only four existing import terminals in the United States, Cove Point began receiving new deliveries in the late summer of 2003. Under full scale operation, up to 103 LNG tankers per year (about two per week) will transit the Bay and offload their cargo at Cove Point.

gas — a trend that may continue for some time. 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 United States to last for decades. Almost 60 percent of those reserves, though, are to be found on federal land; 40 percent are on federal land on which 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, for the first time since 1980, the Cove Point facility began accepting new deliveries of LNG in the late summer of 2003. 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. As noted by Federal Reserve Chairman Alan Greenspan in testimony before Congress in June 2003, "[a]ccess to world natural gas supplies will require a major expansion of LNG terminal import capacity."

Renewed LNG imports at Cove Point will significantly benefit the natural gas supply system in the mid-Atlantic region and throughout the eastern U.S. Natural gas storage is another component of the supply system that provides flexibility in meeting variable demand and helps maintain consistency in prices for this fuel. 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 but have not yet been studied.

It is possible that anticipated expansion in the amount of natural gas-fired generating capacity, coupled with other sources of demand growth, 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 the FERC permit, new pipelines until it is clear that demand will materialize. Once the developer shows that the demand exists — usually through a successful open season (preliminary auction) for capacity — permitting and construction can usually proceed without much difficulty.

Petroleum

There are no petroleum reserves in the state, therefore all petroleum arrives in Maryland via pipelines, overland hauling, and barge. The Colonial Pipeline, a major petroleum products pipeline, traverses the state on its way to New York. About 12 million gallons of petroleum are consumed in the state each day, with about half of that amount consumed as transportation fuel.

A number of power plants in the state use petroleum products (distillate and residual fuel oil) as either a primary or backup fuel. As a backup fuel, oil allows power plants to continue operating when natural gas supplies are interrupted — such as cold winter days when priority is given to residential heating. However, even for those plants with dual-fuel capability, oil is relatively expensive compared to gas. Also, a plant's air permit often places severe

restrictions on the number of hours that the plant can burn oil. 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, with the largest single facility being the Chalk Point plant (6 of 12 units burning oil for about 1,550 MW).

Alternative Energy Sources

There is growing interest in Maryland to encourage alternative generating resources, as these resources are generally environmentally cleaner than conventional fossil generating technologies, may help diversify Maryland's fuel mix, and contribute to local economic development. According to U.S. Energy Information Administration data, less than two percent of the electric energy generated in Maryland comes from non-hydro alternative energy sources (see Table 4-1).

Table 4-1 Net Renewable Generation in Maryland — 2000

Technology	MWh
Hydroelectric	1,732,619
MSW/Landfill Gas	698,797
Other Biomass *	33
Wood/Wood Waste	179,580
Total	**2,551,029**
Total State Generation, All Sources	51,145,380
Percent Renewable	5.0%
Percent Non-Hydro Renewable	1.6%

*Other Biomass is agricultural byproducts, sludge waste, tires, and other biomass solids, liquids, and gases.

In 2000, the Maryland General Assembly approved various tax incentives for energy efficiency and renewable energy. These incentives are scheduled to expire at the end of 2004. Furthermore, in January 2001, a new executive order set a goal for the state to purchase six percent of the state government's electric energy requirements from solar, wind, biomass, landfill gas, and municipal solid waste. In September 2001, the Maryland Department of General Services awarded a contract to PEPCO Energy Services to provide approximately 800,000 MWh of power annually to state facilities in BGE's electric distribution service territory, with six percent of that power coming from renewable energy sources. Finally, the Mid-Atlantic region as a whole has seen several new renewable energy projects come on-line in recent years, and there are some indications that Maryland may see new renewable energy generating plants as well.

The following brief descriptions provide the current market status of wind energy (including offshore wind), solar energy, biogas, landfill methane, waste to energy, and wood residues.

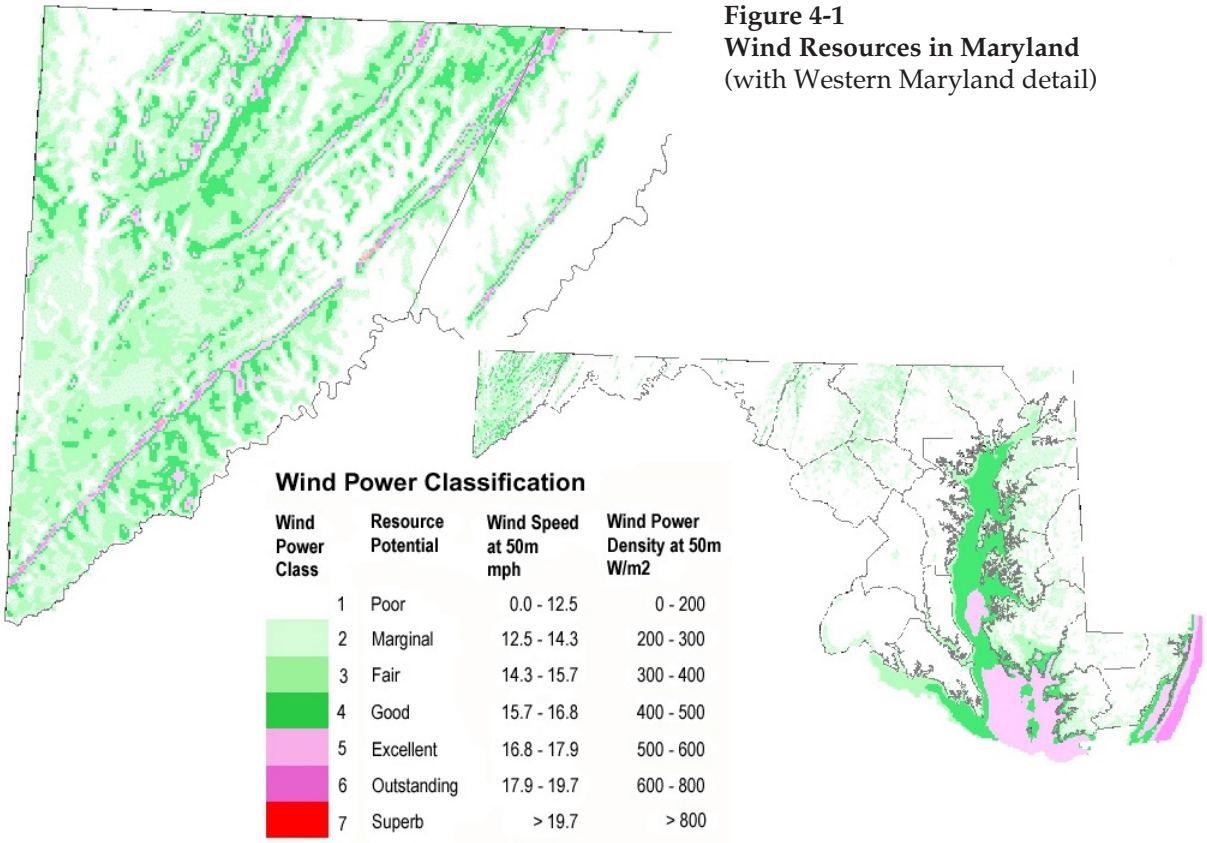


Figure 4-1
Wind Resources in Maryland
(with Western Maryland detail)

Wind Energy

Wind resources are available in the western part of Maryland. Wind resources for electricity generation are categorized into "resource classes," with Class 1 the lowest (zero mph, or no available wind resource) and Class 7 the highest (between 21 and 26 mph). Generally, utility-scale wind projects need at least Class 4 wind resources (13 mph and higher). The best land-based wind resources in Maryland are Class 4 wind resources, and these are located in the western part of the state (see Figure 4-1). Offshore wind development is discussed later in this section.

Two wind companies — Clipper Windpower and US WindForce — each received approval from the Maryland PSC in 2003 to build wind projects in western Maryland. Clipper wants to construct up to sixty-seven 1.5 MW wind turbines along Backbone Mountain near the town of Oakland, for a total capacity of about 101 MW. Clipper plans to construct their plant in two phases, with the first phase consisting of about 70 MW. U.S. Wind Force plans to erect up to twenty-five 1.5 MW turbines near the town of Lonaconing, for a total capacity of 40 MW. If these two wind projects are fully developed, renewable energy's contribution to total generation in Maryland would be expected to increase to approximately 5.7 percent (compared to 5.0 percent as shown in Table 4-1). The percentage of non-hydro renewable energy in Maryland's generation mix would increase to 2.3 percent, compared to 1.6 percent without the wind projects.

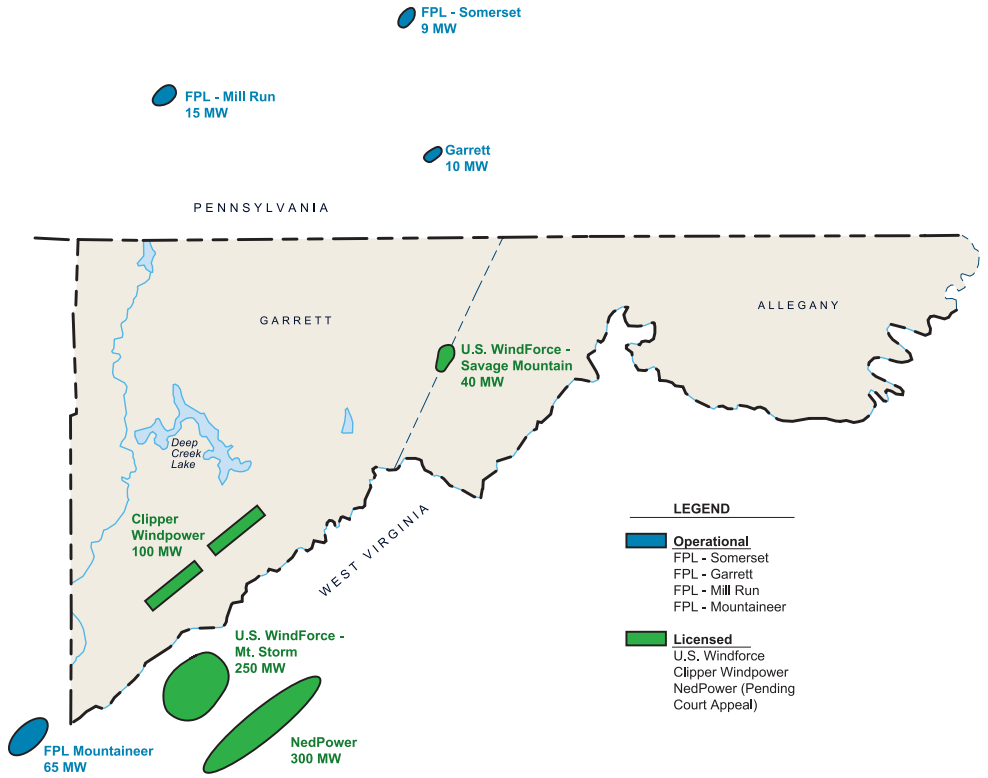
The projects must be operational by the end of 2003 to take advantage of the federal production tax credit (PTC) which, absent congressional action, will expire at the end of 2003. Both Clipper and U.S. WindForce have had difficulty in securing power purchase contracts and believe their projects will not become operational until 2004, assuming Congress extends the PTC. The two wind projects are also eligible for the 0.85 cent/kWh Maryland PTC if Congress does not renew the federal PTC.

If one or both of these wind projects comes to fruition, Maryland will join several other mid-Atlantic states with operating wind projects (see Figure 4-2). Since December 1999, four wind projects with a total capacity of 35 MW have come on-line in Pennsylvania. Another 66 MW wind project became operational in December 2002 in West Virginia. Another 700 MW of wind capacity are in the planning stage in Pennsylvania and West Virginia.

The growth of wind power has been driven by a combination of environmental benefits (as an electricity generating technology with no emissions), federal tax incentives, and increased cost-competitiveness. The cost of wind-generated electricity at good wind sites has dropped from 35 cents per kWh in 1980 to as low as 3 to 4 cents per kWh today (with the federal production tax incentive), and the cost is expected to drop another 35 to 40% by 2006.

These factors have led to a significant increase in wind development in recent years, with wind capacity nationally increasing from 2,500 MW to 4,700 MW in 2002. Another 1,000 to 1,400 MW of wind capacity is expected in 2003. While

Figure 4-2
Wind Energy Projects In and Near Western Maryland



this growth is encouraging, a number of factors must be considered with future wind development. Because wind is an intermittent energy source, concerns have arisen over the costs of integrating wind energy into utility system operations. Wind turbines are also highly visible, and that may be of some concern to local residents.

Although advanced wind turbine designs have helped minimize the potential for avian mortality, care still must be taken to site wind turbines away from migratory bird flyways.

Offshore Wind Energy

Because of scarce land availability, wind projects are increasingly being sited offshore in Europe. There are 10 offshore wind projects in Europe with a total capacity of about 265 MW, with at least 10,000 MW more planned.

The U.S. may see its first offshore wind projects by 2005. Cape Wind Associates is proposing a 468 MW (420 MW net) project consisting of 130 3.6-MW wind turbines on Horseshoe Shoal in Nantucket Sound, five-and-a-half miles off the shore of Hyannis, Massachusetts. The Long Island Power Authority issued a Request for Proposals in 2003 for a 100-140 MW offshore wind project near Jones Beach, New York, by the end of 2007.

Another company, Winergy, is exploring potential offshore windpower sites near Maryland. Winergy is exploring 14 sites along the eastern seaboard, including two areas located in coastal waters 3.5 miles off Maryland's shore . The project that Winergy has named Isle of Wight would consist of 352 wind turbines with a total capacity of 1,267 MW, located offshore from Ocean City. The second site, off Assateague Island, is named Gulf Bank and would consist of 506 turbines for a total capacity of more than 1,800 MW. While Winergy has not filed any permit applications or requested specific approvals for these projects in Maryland, the company has filed an application with the U.S. Army Corps of Engineers for wind turbine construction at another nearby site, in Virginia off the southern tip of the Delmarva Peninsula.

Offshore winds tend to be stronger and steadier than those onshore, and larger wind turbines can be used offshore, as trucking size restrictions limit the size of onshore wind turbines. Offshore wind projects can also use higher rotor speeds and generate more energy. Offshore wind projects can therefore generate as much as 40 to 50% more energy than onshore wind projects. These factors can lead to greater economies of scale for offshore wind projects compared to onshore wind projects. Offshore sites may also be closer to load centers than onshore wind projects that are in remotely populated areas.

However, there are a number of challenges towards developing offshore wind projects, including protecting equipment against corrosion from salt spray; constructing towers and foundations to tolerate high waves and strong ocean currents; construction and maintenance delays because of high seas and hostile weather; and simply the logistics of transporting people and equipment to and from the offshore site. Early experience with offshore wind projects suggests that wind turbines may only be accessible 80% of the time during the summer months and even less during other times of the year, because of rough weather and logistical difficulties. This means turbine maintenance requirements may take longer to respond to, lowering offshore turbine availability from the usual

97 to 99% turbine availability for onshore wind projects. These challenges also affect the cost of energy for offshore wind projects. According to a feasibility study performed for the Long Island Power Authority, current estimates of the costs of energy from an offshore wind project range from six to nine cents per kWh.

Marine habitats, and avian and fish populations are not well documented in many areas, and there is not a full understanding of the impacts of offshore wind turbines on marine habitats and animal species during construction and operation. Visibility concerns may also be an issue. On a clear, dry day, offshore wind turbines may be visible from as far as 20 miles.

Permitting responsibilities for offshore wind projects are divided among the U.S. Army Corp of Engineers, the Coast Guard, and the Federal Aviation Administration. Since there has not yet been an offshore wind project in the U.S., there is no case law, statutory interpretation or administrative guidance to rely upon. Best estimates indicate that it can take at least three years to permit an offshore wind project. Congressional legislation has been introduced to designate a single federal agency (yet to be determined) as the lead agency in permitting offshore wind projects, and to render some potential sites off-limits to offshore wind development, such as the proposed Horseshoe Shoal site in Massachusetts.

Solar Energy

Maryland has solar grant and loan programs for installing rooftop solar panels on state and local government facilities, and a solar schools program that also offers grants for the installation of solar systems on school rooftops. Maryland is also active in the U.S. Department of Energy's Million Solar Roofs program that aims to have one million rooftop solar systems installed by 2010. As a result, there are 25 planned or operating solar systems in Maryland, although the small size of these systems results in only about 265 kW of capacity being available from these systems.

Of all the renewable energy technologies, solar energy is the most expensive, with generating costs of at least $0.20 to $0.40 per kWh, compared to $0.04 to $0.05 for new natural gas combined cycle plants. 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.

Biogas

Biogas systems are anaerobic digesters installed at dairy farms or at wastewater treatment plants. These projects result in multiple environmental benefits, such as reducing greenhouse gas emissions from decomposing animal byproducts and combusting the waste byproducts that are normally disposed of in landfills or spread across agricultural lands as a fertilizer. A CPCN was granted for a 4 MW biogas facility at Allen Foods in Dorchester County, but the project has not yet been developed.

Biogas systems have relatively high capital costs, and the payback from energy sale revenues is generally not sufficient to induce investment without additional financial incentives. Whether Maryland has sufficient and geographically concentrated supplies of animal waste or waste from wastewater facilities is also an issue.

Landfill Methane

Maryland currently has one operating landfill gas project (the 2.9 MW Gude project in Rockville) and one that is scheduled to come on-line in 2003 (the 4.2 MW Brown Station project in Upper Marlboro). A potential landfill gas project in Baltimore County is in licensing before the Maryland Public Service Commission, although an ownership change has slowed the development of that project. Yet another potential project, located at the Montgomery County landfill in Laytonsville, was licensed but never constructed.

Including the landfill projects mentioned above, the U.S. EPA has identified 40 landfills in Maryland that could be candidates for either gas-producing or electricity-producing landfill methane projects, representing 91 MW of capacity and 915 mmBTU per hour of gas capacity. A rule of thumb for landfill methane is that 1 million tons of domestic or industrial waste will produce about 500 cubic meters per hour of landfill gas, which is the amount of fuel required for a 1 MW generator. Of these 40 landfills in Maryland, 12 have a capacity of 2.5 million tons or more of waste.

Nationally, according to the U.S. EPA, there are 229 landfill methane electric plants with a total capacity of 977 MW, with another 28 facilities and 120 MW under construction, and 89 more in planning, representing 277 MW. Landfill methane development has been driven in large part by the Unconventional Fuels Tax Credit, enacted in 1980 but which expired in June 1998. The tax credits for landfill methane facilities installed before 1993 expired at the end of 2002, but run through 2007 for gas wells that went into service from 1993 through 1996. The credit is inflation-adjusted and was set at $1.082 per mmBTU in 2002.

Landfill methane projects are perhaps the most market competitive of all the renewable energy technologies, although historically, landfill methane projects are typically slightly higher priced than natural gas projects. Because of this, landfill methane is a popular renewable energy source for green power marketers.

Similar to biogas, landfill methane 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, landfill methane systems do emit other air pollutants, such as NO_x, CO, SO_x, and particulates.

Waste-to-Energy

Maryland has two large waste-to-energy plants (Montgomery County and Baltimore City) that together represent about 115 MW of capacity. The Montgomery County facility handles an average of 1,500 tons of municipal solid waste a day and can generate up to 55 MW. The Southwest Resource Recovery

Facility in Baltimore processes up to 2,250 tons of municipal solid waste a day and can generate up to 60 MW. Nationally, there are 102 waste-to-energy plants, representing about 2,800 MW of capacity.

Like biogas and landfill methane, waste-to-energy plants can provide environmental benefits by combusting waste in landfills that would otherwise release methane and other greenhouse gases. Waste-to-energy plants also reduce the use of landfills. However, local opposition to waste-to-energy plants has grown because of concern over certain air emissions (e.g., dioxins) and because of increasing interest in encouraging more recycling. In addition, 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. These reasons, as well as generally declining energy prices, have slowed waste-to-energy development considerably in recent years.

Wood Residues

There are two wood residue projects in Maryland with a total capacity of about 4.5 MW. The Eastern Correctional Institution has a 4 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 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 new wood residue plants built in the mid-Atlantic region in recent years, with the last one being built in 1988. Wood residue projects are relatively high-cost compared to alternative electric power 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.

Some utilities are experimenting with co-firing small amounts of biomass with coal to reduce SO_2, CO_2 and NO_x emissions. In a two-year pilot program, Allegheny Energy Supply has been co-firing sawdust from sawmills in Maryland, Pennsylvania and West Virginia at the Willow Island and Albright coal-fired power plants in West Virginia.

Solid biomass can be blended with coal and fed into the boilers, or biomass can be injected separately into the boilers.[1] Blended coal-wood feed into boilers can cause some operating problems with certain boilers, particularly pulverized coal boilers, and experts recommend the biomass percentage be limited to no more than 2% to 3% by heat input (4% to 5% by mass). Injecting biomass separately

[1]Other biomass feedstocks can potentially be co-fired with coal in lieu of wood residues. These could include tire-derived fuel, municipal solid waste, and agricultural residues.

into the boiler can allow for higher biomass percentages — up to 15% on a heat input basis (about 30% by mass). However, separate biomass injection means separate fuel handling equipment and fuel preparation are required, adding to plant capital and operating costs.

Green Power Initiatives in Maryland

State Procurement

In September 2001, the Maryland Department of General Services selected PEPCO Energy Services to provide "green power" to meet 6 percent of the state government's electric load in BGE's electric distribution service territory. The green power under that contract comes from a mix of landfill methane and waste-to-energy, and will result in 48,000 MWh of renewable energy being supplied annually to the state. The contract will run for two years (until July 2004) and represents $2 million annually in green power purchases by the State. The green power component of this contract entails a price premium of about 9 percent over power generated from conventional sources.

Renewables Portfolio Standards

During 2003, the General Assembly considered, but did not pass, legislation to establish a renewables portfolio standard (RPS) for Maryland. In general, an RPS requires retail electricity suppliers to include a specified minimum percentage of eligible renewable energy in the electricity supplied to retail customers. The intent of an RPS is to improve environmental quality; provide fuel diversity to reduce the adverse impacts of potential price shocks and supply disruptions that may be associated with fossil fuel dependence; and preserve non-renewable fuels through greater reliance on renewable fuels.

Suppliers can meet the RPS requirement from renewable energy generation from plants they own or through bilateral purchases of renewable energy from other suppliers. Suppliers in some states can also purchase and trade renewable energy credits (RECs) in sufficient quantity to satisfy the standard. The RECs may be issued by the overseeing agency or a regional power pool certifying that generators have produced the renewable energy or by an independent entity, perhaps under contract to the overseeing agency or regional power pool. The credits can then be sold to suppliers without necessarily physically transmitting the electricity.

At a minimum, an RPS program needs to define the technologies that are considered to be "renewable" for purposes of satisfying the standard and the percentage of energy sold in the state that must be generated using renewable sources of fuel. Other elements of an RPS could include the following:

- *initial program year requirements, which increase gradually to a maximum requirement;*
- *who must comply with the requirement;*
- *who should administer the RPS;*
- *whether the requirement should protect existing renewables as well as encourage new renewables;*
- *sunset provisions;*
- *penalties for non-compliance, such as a $/MWh penalty for non-compliance or other punitive measures such as limiting the ability of the non-complying company to sell to customers or to take on new customers;*
- *establishment of a mechanism to limit program cost exposure, i.e., a cost cap;*
- *the inclusion of various flexibility mechanisms, such as banking of RECs; force majeure penalty exceptions; true-up periods; and the borrowing of RECs;*
- *mechanisms to ensure that a certain portion of the RPS requirement be met from a particular renewable technology or set of technologies (e.g., solar or wind);*
- *mechanisms to establish a system of tradable renewables credits; and*
- *specification of generation facility siting requirements (e.g., in-state or within a given region).*

No national policy has been established. The RPSs that have been implemented in other states, or that have been proposed in bills currently pending before Congress, vary substantially in terms of structure and the specific requirements and constraints that govern the actual operation of the RPS. The fundamental underlying purposes of these programs, however, are consistent. Currently, 13 states have renewables portfolio standards; Maryland does not.[2] Federal legislation establishing a national RPS was introduced in the 107th Congress but did not pass. It is likely that the federal RPS will be revisited in the current (108th) Congress and a Maryland RPS may be readdressed by the Maryland Legislature at some future date. In the 2003 session, the General Assembly did not pass either of the two RPS proposals submitted for consideration.

[2] The 13 states that have implemented renewables portfolio standards are: Arizona, California, Connecticut, Iowa, Maine, Massachusetts, Minnesota, Nevada, New Jersey, New Mexico, Pennsylvania, Texas, and Wisconsin.

Nuclear Power

Although no specific new plants are currently being planned, nuclear power technology appears poised for possible resurgence. According to the Nuclear Energy Institute (NEI), a nuclear energy and technology policy organization, nuclear energy currently generates 20 percent of the nation's electricity. Nuclear's share of PJM generation is much greater, approximately 36 percent. In Maryland, nuclear's share of generation is about 28 percent, all of it generated by Constellation Nuclear's Calvert Cliffs plant. As electricity demand and generating capacity continue to grow over the next 20 years, 60,000 MW of new nuclear capacity would need to be added to the grid if nuclear power is to maintain its 20 percent share of national capacity. This new capacity could be achieved through a combination of efficiency improvements and the construction of new generating units (NEI suggests 10,000 MW and 50,000 MW, respectively).

Supporting this course of action, the Bush administration has made nuclear power a major element of its national energy policy. The May 2001 report of the President's National Energy Policy Development Group suggests that the Nuclear Regulatory Commission (NRC) facilitate the uprating and relicensing of existing nuclear plants, and streamline the process for licensing new plants. The report also recommends that the government make a priority of nuclear technology research and establishing a national repository for nuclear waste. Toward that end, the President's fiscal year 2004 budget request includes $387.6 million for Department of Energy nuclear research and development, an increase of approximately 5 percent over 2003 appropriations. In February 2002, President Bush also recommended approval of the Yucca Mountain nuclear waste disposal site and in July 2002 he signed a congressional resolution overturning a Nevada state veto on further activity at Yucca Mountain. The U.S. Department of Energy's Nuclear Power 2010 program provides financial support to companies to offset the costs of applying for site permits for nuclear generation facilities. Federal energy policy legislation is also expected to provide financial support for nuclear generation in the form of liability insurance support and construction loan guarantees.

Meanwhile, real progress for nuclear power has been more equivocal. On the one hand, owners of operating plants have had success at obtaining 20 year license extensions from the NRC. Constellation Energy Group was the first to accomplish this, relicensing the two unit Calvert Cliffs Nuclear Power Plant for operation through 2036. Most recently, Exelon successfully extended the license of its Peach Bottom Atomic Power Station in York County, Pennsylvania. Another 12 generating units around the country have also already received license extensions and the applications of 14 more are pending. Another positive factor for nuclear power has been the continued success of operating units in receiving NRC approval for increasing output (also known as a capacity uprate).

On the other hand, the process for licensing new plants is still lengthy and the federal government is still not yet accepting nuclear waste for storage at Yucca Mountain. The NRC's December 2002 Semiannual Update of the Status of New Reactor Licensing Activities reports that the Westinghouse Electric Company has submitted an application for final design approval and standard design

certification for the AP1000 nuclear reactor. Also, three companies — Dominion, Entergy, and Exelon — are working on applications to the NRC for early site permits. These permits would allow them to build, sometime in the next 20 years, new generating units at existing nuclear power plant sites in Virginia, Mississippi, and Illinois. However, the NRC does not expect to issue decisions on the design certification until December 2005 or final site approval until 5 years after the permit applications are actually submitted. Additionally, while according to the head of General Electric's power equipment manufacturing division, several customers are "very serious" about building a new nuclear plant, developers are unlikely to proceed until they are assured that waste can be shipped offsite. Thus, it seems unlikely that any new nuclear generating facility will begin operating within the next ten years. For Maryland, this time horizon may be substantially longer given the significant water use requirements characteristic of nuclear plants and the potential adverse environmental implications for the Chesapeake Bay and its tributaries.

Security Issues

Security of critical infrastructure, including electric power infrastructure, has always been a concern. The terrorist attacks of September 11, 2001, however, served to heighten our sensitivity to the vulnerability of certain types of facilities. Of particular concern in this regard are facilities that affect the public health or welfare or that have important economic implications. 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 our 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 some industrial and governmental facilities, certain of Maryland's energy facilities are regarded as potential targets of terrorism. Principally, these facilities include hydroelectric, nuclear, and fossil fuel fired power plants; high-voltage transmission lines that connect (directly or indirectly) to power plants, transmit power over long distances, and are critical to the operation of the electric grid; 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 measures, including technology and surveillance equipment, trained security personnel and security plans. The level of security in place, however, varies widely, as does the cost of providing security in an increasingly security-conscious environment.

In the case of nuclear power plants such as Calvert Cliffs and Peach Bottom, the NRC has formalized, through a federal rulemaking and also through operating license conditions, requirements which are intended to ensure the highest level

of security at these facilities. Each elevation in security alert status, as determined to be appropriate by the federal Office of Homeland Security, entails 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, there do not currently exist federally mandated specific requirements at fossil-fueled power plants or hydroelectric facilities. In Maryland, as elsewhere in the U.S., facility owners and operators have developed security plans and implement them 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 a group of proximate structures, transmission lines traverse many miles and can stretch across relatively remote areas. Fully securing these facilities from possible sabotage is not economically feasible. The degree to which damage can be inflicted, however, is modest (in comparison to the damage that could be inflicted on other potential targets) and damaged transmission line facilities can generally be repaired, and service restored, quickly, assuming the damage is localized. The grid itself is designed to bypass a point outage.

Substations, which serve to redirect power incoming over high-voltage transmission lines and redirect that power to various parts of the grid, can, if damaged, cause widespread electrical outages for long durations, 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, however, fenced or walled perimeters can be established around substations to secure the facilities, but unlike power plants, substations are frequently unmanned.

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 large part. In the case of the electric power industry in Maryland, the ability to pass on increased costs to the end-user is 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 expires in 2004, the distribution utilities have the option to request that the PSC permit them the opportunity to recover such costs as part of an overall revenue requirement.

With respect to power generation, which is a competitive activity in Maryland, generation facility owners have the ability to recover the added costs of security to the same degree that other costs (fuel costs, O&M costs, capital costs) can be recovered. 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 able to be recovered until such time as 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. Further, the public also pays a non-monetary cost through reduced access to properties formerly utilized for public activities. There are several important examples of this in Maryland.

- *A Chesapeake Bay Security Zone is to be established and enforced by the U.S. Coast Guard near the Cove Point LNG facility in Calvert County and will forbid access to 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 for the remainder of the year.*

The security of Maryland's electric infrastructure has received increased attention since 2001. While all Maryland users of electric power benefit from the heightened security measures being undertaken, additional security means additional costs, both in monetary and non-monetary terms. The non-monetary costs are borne by the general population, or specific subgroups of the population. The monetary costs are shared by the electric companies (generation, transmission, and distribution) and the end-users.