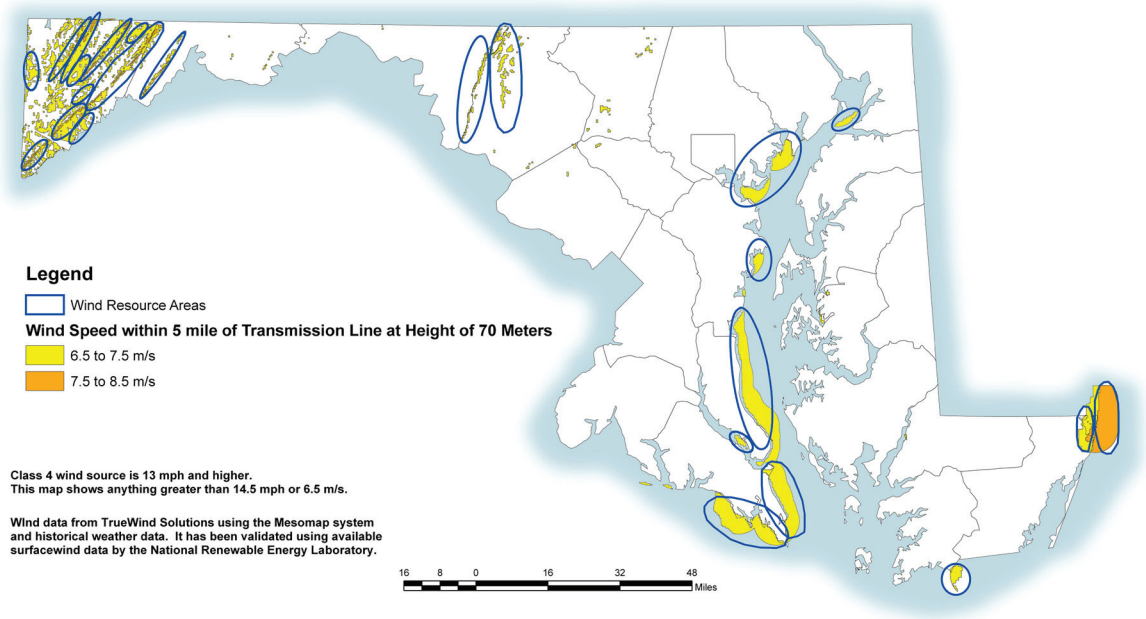
Toward a Sustainable Energy Future

Growing concerns about climate change and its impacts on the environment, economy, and society have led to increased pressure on businesses to operate in a sustainable way, and on governments to implement sustainable development policies. The term "sustainability," or "sustainable development," was first coined in 1987 by the World Commission on Environment and Development, more commonly known as the Brundtland Commission after Norway's former prime minister who chaired it. In its report, the Commission defined sustainable development as "development which meets the needs of current generations, without compromising the ability of future generations to meet their own needs." Over the past two decades, global understanding of sustainability has come to recognize three closely linked pillars: environmental, social, and economic.

When considering energy generation there is growing interest in energy resources that are both sustainable and renewable. Renewable resources are those that are continually being replenished and are not being used faster than they can be replaced. These resources have negligible opportunity costs - meaning that resources that are useful for other purposes are not being depleted for electricity generation. Renewable energy resources include sunlight, tides, wind, and geothermal heat.

Any long-term energy supply scenario based on principles of sustainable development is likely to include increasing amounts of renewable resources. A sustainable energy future will also include demand-side resources such as conservation practices and application of more energy-efficient technologies.

Figure 3-1
Maryland Wind Resource Areas



Court Delays in Allegheny Heights Project

Legal challenges have beset Clipper's Allegheny Heights Project since the CPCN was issued; however, all have now been resolved in the court system. Adjacent landowners sued the Commission shortly after the CPCN was issued, asserting they did not receive adequate notification, and the Circuit Court and the Maryland Court of Special Appeals each voted to remand the Clipper case to the Commission to consider issues of noise and property values. The Maryland Court of Appeals agreed to hear the case in January 2007. Separately, the Maryland Court of Special Appeals in April 2007 ruled that the Commission should not have approved Clipper's request to change its project without a hearing. In February 2007, Clipper petitioned the Commission to transfer its wind project via sale to Constellation GreenEnergy LLC. The Commission approved Clipper's petition in March 2007.

Renewable Resources In Maryland

Presently, there are four types of renewable resources in use or under consideration in Maryland: wind, biomass, solar, and water (hydroelectric). Each of these resources is discussed in detail in the following sections.

Wind Power

Wind is a renewable resource and is abundant in some geographic areas. The conversion of wind power to electricity is typically accomplished by constructing an array of wind turbines in a suitable location. In order to better estimate Maryland's wind resource capability, PPRP utilized two different methods, both utilizing a commercially available software package called WindFarm©.

One approach was to use WindFarm© to predict wind power output capacity from four wind resource areas, and extrapolate data resources areas across the state. The second uses wind speed data prepared by AWS TrueWind Solutions for the Maryland Energy Administration against a power curve of the 2.5 MW GE wind turbine that was used in the modeling analysis. Using these two methods, PPRP estimates total wind resource capability in Maryland to be between 627 MW and 1,078 MW. Figure 3-1 illustrates the prospective wind resource areas in Maryland that were evaluated in the analysis.

Proposed Maryland Wind Projects

Since 2003, applications have been filed for three proposed wind projects in Maryland with a potential total capacity of about 180 MW (see Table 3-1 and approximate sites in Figure 3-2). The Commission has granted CPCNs to two of the three, and a PSC Hearing Examiner recommended granting a CPCN to the third. However, each of the three projects have faced various challenges and none have yet to begin construction.

Clipper's project at Allegheny Heights, now owned by Constellation, has faced legal challenges. US WindForce did not experience legal issues, but needed to extend its CPCN since the reclamation project to backfill lands that were previously strip mined have taken far longer than anticipated.

Synergics proposed construction of its wind power facility on Backbone Mountain, close to Clipper's proposed project and 1.5 miles from the border of Maryland and West Virginia. The Maryland Department of Natural Resources recom-

Table 3-1. Wind Power Proposals in Maryland

Developer Name	Proposed Size (MW)	Location	Nearest Town	Wind Turbine Size	Number of Turbines	Date of CPCN
Criterion – Clipper/ Constellation (originally called Allegheny Heights)	100 MW	Backbone Mountain	Oakland, MD	2.5 MW*	40	March 2003
Savage Mountain – US Wind Force	40 MW	Savage Mountain	Lonaconing, MD	1.6 MW	24	March 2003
Roth Rock – Synergics	40 MW	Backbone Mountain	Oakland, MD	1.6 MW	24	TBD

* Initially, Clipper anticipated using 67 1.5 MW General Electric wind turbines but in June 2005 successfully petitioned the PSC for approval to switch to 40 2.5 MW wind turbines.

mended that parts of the northern and southern portions of the site be excluded from wind turbine development due to environmental issues. The preliminary order allowed up to 14 of the 24 proposed turbines to be constructed on the site. A proposed order was issued in October 2006 recommending issuance of a CPCN with DNR's proposed conditions. All parties, except for DNR, appealed the proposed order to the Commission and it is under review at this time.

Figure 3-2
Approximate Locations of Proposed Wind Energy Projects

During the legislative session in early 2007, the Maryland General Assembly passed legislation allowing new windpower facilities less than 70 MW in capacity to request an exemption from the CPCN requirement. Such facilities will still be subject to any federal, state, and local approvals needed to address erosion and sediment control, Federal Aviation Administration lighting requirements, threatened and endangered species impacts, and many other relevant issues.

Windpower Technical Advisory Group

The Maryland Renewable Energy Portfolio Standard legislation, passed in the 2004 General Assembly session, established a technical advisory group (TAG) to recommend standards to avoid or minimize impacts on birds and bats from the construction and operation of wind energy generating facilities. The standards were to consider the size and capacity of the wind energy generating facility, the need for assessments on avian and bat populations, monitoring of avian and bat populations during and after construction of a wind project, and mitigation approaches. The TAG submitted its draft guidelines to the PSC in June 2006. The guidelines recommended that when filing for a CPCN, applicants should:

- *avoid locations considered to have high risk to birds or bats, have unique habitat features or include species considered rare, endangered or threatened;*
- *include the results of one year of monitoring on the proposed site for birds and bats. The monitoring shall be seasonally and spatially appropriate and may include radar*

Offshore Wind Power

The Energy Policy Act of 2005 granted the Minerals Management Service (MMS) authority over the development of alternative energy projects on the Outer Continental Shelf (OCS) including wind power. Since that time, offshore windpower facilities have been proposed for development off the Atlantic Coast of Delaware, Maryland, and Virginia. With several hundred turbines, the projects would have significant generating capacity (> 600 MW). The proposed turbines would be located in federal waters and at least 6 miles offshore.

An offshore project in Delaware was recently tabled by state reviewing agencies over cost concerns; however, new motions within the state government may soon revive the project. Delaware agencies involved with project review are the Delaware Public Service Commission (PSC), the Delaware Energy Office, the state Office of Management and Budget, and the Controller General's office. Once a final project site has been selected, environmental studies will be undertaken to evaluate environmental impacts. The timeline for the project estimates construction would begin 1 to 2 years after the contract is awarded and after all of the necessary permits have been obtained.

In New Jersey, although no offshore projects are currently proposed, the Department of Environmental Protection is proceeding with baseline studies of bird, sea turtle, and marine mammal use of coastal waters out to 20 miles offshore. The studies will document seasonal distributions species using both radar and transect surveys by boat and aircraft. Fish and other commercial species will be addressed through the use of existing fisheries data.

The studies planned for New Jersey and Delaware will provide important information for assessing potential impacts of offshore windpower development along the coast of Maryland and within the Chesapeake Bay.

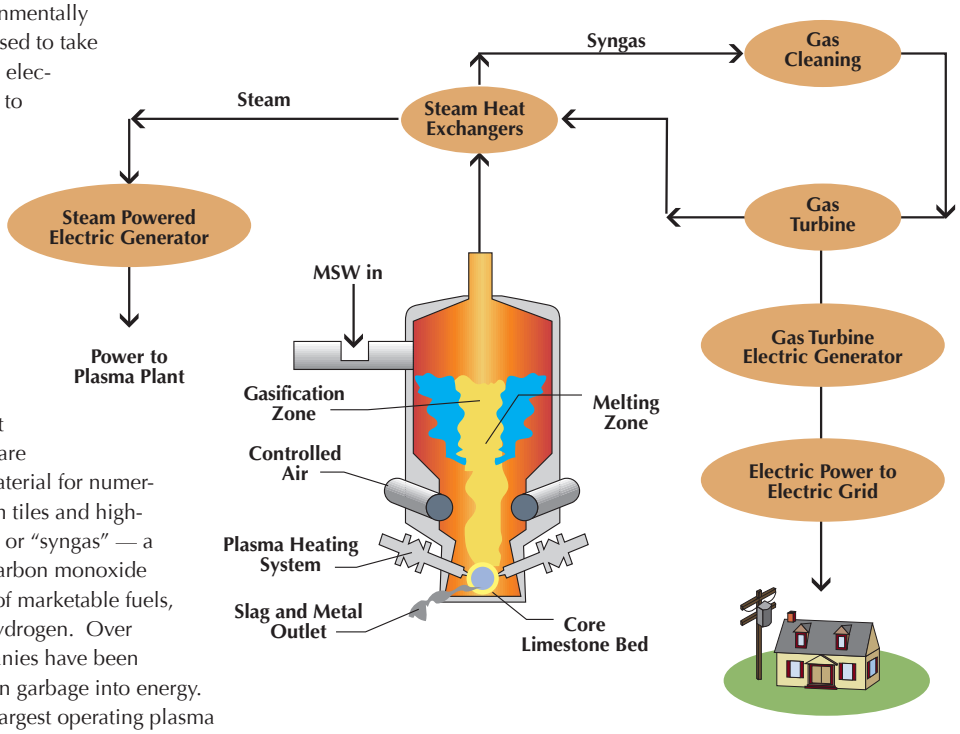
monitoring for migrating birds and acoustic monitoring for migrating bats;

- *include an assessment of potential bat habitat on the site;*
- *include the results of a Phase 1 avian risk assessment;*
- *include the results of a survey of breeding birds for the project area;*
- *commit to conduct a post-construction study of bird and bat mortality rates for three years, with data and results reported to DNR's Natural Heritage Program and PPRP after each migration period; and*
- *notify DNR's Natural Heritage Program as soon as possible if larger than expected number of avian and bat fatalities are observed.*

The TAG guidelines, which await action by the Commission, did not recommend specific mitigation actions but instead left it to prospective wind project applicants to propose as part of their CPCN application. Any such mitigation plans can involve onsite or offsite species and should be graded in implementation in order to assess the proposed impact and probability of success. The guidelines also stated that potential mitigation plans could be defined in the licensing conditions that would be triggered if certain events occur. Finally, any unforeseen adverse impacts to bird and bat populations that may occur once a wind project is operating may prompt the State to request corrective actions to avoid, minimize, or mitigate these impacts.

Waste-to-Energy: Plasma Gasification

Touted as highly efficient and environmentally benign, plasma gasification can be used to take municipal solid waste (MSW), create electricity, and leave an inert slag similar to vitrified glass. This new technology may be commercially viable for future waste-to-energy projects in Maryland. Passing electricity through ionized gas (plasma) creates a field of extremely intense, lightning-like energy in a plasma arc. The arc is so powerful that it disintegrates matter by tearing apart molecular bonds. Capable of breaking down just about anything, except nuclear waste, the only by-products are the slag that can be used as a raw material for numerous applications, including bathroom tiles and high-strength asphalt, and a synthetic gas, or "syngas" — a mixture of primarily hydrogen and carbon monoxide that can be converted into a variety of marketable fuels, including ethanol, natural gas and hydrogen. Over the past decade, half a dozen companies have been developing plasma technology to turn garbage into energy. A facility in Utashinai, Japan, is the largest operating plasma plant and processes approximately 300 tons per day, generating 7.9 megawatt-hours (MWh) of electricity. While Japan hosts the only three plasma gasification plants currently in service, a project using plasma technology is moving forward in St. Lucie County, Florida. The 100,000-square-foot plant, slated to be operational by 2010, is expected to vaporize 3,000 tons of garbage a day. St. Lucie County officials estimate their entire landfill — 4.3 million tons of trash — will be gone in 18 years. The synthetic gas produced in the process will fuel a 120 MW facility.



Biomass and Waste-to-Energy

In the energy production sector, biomass refers to biological material that can be used as fuel. Biomass fuels are most commonly created from wood and agricultural wastes, alcohol fuels, animal wastes, and municipal solid waste. Biomass can be combusted to produce heat and electricity, transformed into a liquid fuel such as biodiesel, ethanol or methanol, or transformed into a gaseous fuel such as methane. Maryland has several biomass-to-energy facilities including several that use landfill gas, waste wood, and black liquor (a bio-based byproduct of the pulp and paper industry).

Constellation Tests Biofuels at Philadelphia Road

In April 2007, Constellation Power Source received permission to conduct a test burn of biodiesel at its Philadelphia Road generating station. The test burn will involve two different biofuels. The first fuel combines domestically produced oils (cooking oil, soy oil, and animal fats) with water and an additive in a microemulsification process. The second fuel is derived through a gasification process where oil is extracted from a feedstock. Constellation Power Source will blend each of the biofuels with No. 2 fuel oil to evaluate the technical capabilities of the current equipment and measure impacts on NO_x, SO_2, CO_2, and diluent emissions. Constellation plans to use combinations of between 20 and 100 percent biofuels in a series of two and a half hour tests.

Landfill Gas

Landfill gas (LFG) is created when solid wastes decompose in a landfill. The amount of gas produced in a landfill depends upon the characteristics of the waste, the climate, the residence time of the waste, and operating practices at the landfill. If no capture or extraction measures are employed, landfill gas will release into the atmosphere as a combination of methane and CO_2 with small amounts of nonmethane organic components. If the landfill gas is extracted and combusted (e.g., flared or used for energy), then the methane produced in the landfill is converted entirely to CO_2. Both CO_2 and methane are greenhouse gases; however, methane has 20 times the global warming potential of carbon dioxide, so converting methane to CO_2 provides an important benefit. Many landfills capture LFG and simply burn it off in a flare to prevent a potentially explosive buildup of gas. Combusting LFG instead to generate power makes use of this otherwise wasted energy and also reduces odors, contaminants, and greenhouse gases. Table 3-2 lists the landfill gas-to-energy projects that are currently operating in Maryland.

Table 3-2. Landfill Gas Projects in Maryland

Landfill Name and Location	Year Opened	Closure Year	Waste per Year (tons in 2005)	Total Waste in Place (tons as of 2006)	LFG Energy Project Start Date	LFG Energy Project Type	MW Capacity
Brown Station Road (Prince George's County)	1968	2010	400,000	8,900,000	1987/2003	Electricity/Thermal	7
Eastern (Baltimore County)	1982	2027	200,000	3,800,000	2006	Electricity	4
Gude (Montgomery County)	1965	1982	Closed	4,800,000	1985	Electricity	3
Sandy Hill (Prince George's County)	1978	2000	Closed	5,100,000	2003	Thermal	-
Newland Park (Wicomico County)	1955	2045	117,000	2,700,000	2007	Electricity	6

Notes: Gude and Sandy Hill landfills are closed and are no longer accepting waste. The LFG facilities continue to operate. LFG from Sandy Hill is combusted to generate heat only, not electricity.

The capacity rating of Newland Park reflects the maximum capacity rating of 6 MW when firing diesel fuel. When operating in single fuel/LFG mode, the facility's capacity rating is approximately 3 MW.

Source: U.S. EPA Landfill Methane Outreach Program database

According to the Landfill Methane Outreach Program of the U.S. Environmental Protection Agency, a good candidate for an LFG-to-energy project should have the following characteristics:

- *Currently accepting waste, or closed for five years or less*
- *At least 1 million tons of waste in place*
- *At least 30 feet deep*
- *Receive at least 25 inches of rainfall annually*

Based on these criteria, the Maryland landfills identified in Table 3-3 may be good candidates for an LFG project.

Table 3-3. Landfills in Maryland with LFG Potential

Landfill Name	County	Year Opened	Closure Year	Waste per Year (tons in 2005)	Total Waste in Place (tons as of 2006)
Alpha Ridge	Howard	1980	2008	55,000	3,500,000
Beulah	Dorchester	1973	2010	74,000	1,800,000
Central	Cecil	1990	2065	161,000	900,000
Hog Hill	Montgomery	1979	2046	250,000	1,500,000
Millersville	Anne Arundel	1975	2060	150,000	6,300,000
Quarantine Road	Baltimore City	1983	2014	416,000	8,500,000
Reichs Ford	Frederick	1969	2017	280,000	3,800,000
Resh Road	Washington	1982	2001	closed	2,100,000
Saint Andrews	St. Mary's	1960	2001	closed	2,250,000

Source: U.S. EPA Landfill Methane Outreach Program database

Cofiring Biomass Resources with Coal

Utility-scale cofiring of biomass and coal to generate electricity is relatively undeveloped in Maryland and most of North America. However, cofiring biomass with coal may be a viable option for Maryland coal-fired electricity plants as energy companies seek alternative methods to meet both the State Renewable Energy Portfolio Standard and the Regional Greenhouse Gas Initiative. Significant hurdles to pursuing biomass cofiring are the availability, handling, and preparation of biomass fuels.

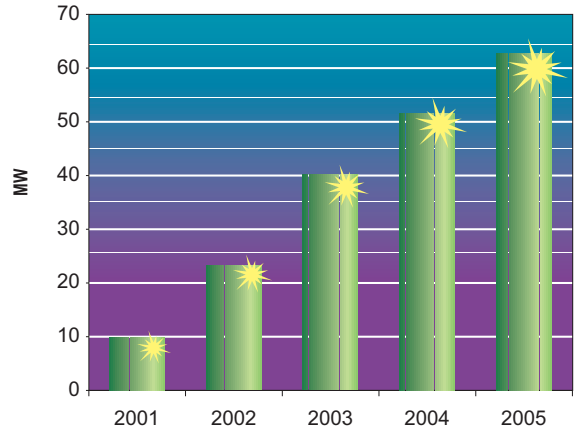
Table 3-4 shows the potential availability of biomass resources in Maryland and the quantity of resources that might be required to supply 3 to 10 percent of the

Table 3-4. Biomass Cofiring Resources in Maryland

Biomass Resource	Heat Content (Million Btu per Short Ton)	Potential Available (Tons per Year)	Amount Required for Cofiring in a 300 MW Facility in Tons per Year		
			3% of Fuel	5% of Fuel	10% of Fuel
Forest Residue	9.6	136,900	73,297	122,161	244,322
Mill Residue	14.0	148,750	50,261	83,768	167,535
Urban Wood Waste	10.0	275,800	70,365	117,275	234,549
Agricultural Residue	8.3	622,800	84,777	141,925	282,589
Switchgrass	14.7	251,000	47,867	79,779	159,557

fuel for a 300 MW coal-fired facility. Cofiring coal with between 3 and 10 percent biomass is technically feasible for many coal facilities without requiring capital investments in boiler retrofits, or separate fuel injection. Greater than 10 percent might create mechanical and efficiency problems associated with slagging and blending fuels in the pulverizer. Handling and preparation of biomass fuels may challenge facilities as biomass resources have higher moisture content and lower heating values than coal, and subsequently require a much larger space for on-site storage. Additionally, the location of biomass resources and the cost of transporting resources to a facility might increase fuel supply costs to the point where biomass is not a cost-effective alternative to fossil fuels. Resources located outside of a 50-mile radius are likely to be too expensive to transport.

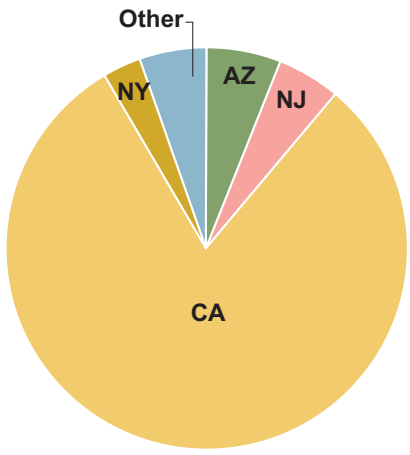
Figure 3-3
U.S. Annual Grid-Tied Solar PV Installations 2001-2005



Solar

High electricity prices and an increasing number of federal and state rebate and incentive programs contributed to a significant increase in grid-tied solar photovoltaic (PV) capacity nationally over the past five years (see Figure 3-3). The four leading states in grid tied solar installations are California, New Jersey, Arizona, and New York (see Figure 3-4). All have aggressive policies and incentives to encourage the use of solar electricity. A summary of state incentives for solar photovoltaic systems is provided in Table 3-5.

Figure 3-4
Grid-Tied PV Concentrated in a Few States



Much of the recent growth in grid-tied solar PV has been in commercial installations. Project integrators have established new business models taking advantage of high retail prices, incentive programs, and renewable portfolio requirements to install and maintain large commercial systems. Customers enter into a long-term contract (10-20 years) for the purchase of the electricity at a competitive, often fixed, rate. The project integrator owns and maintains the system located on the customer's site. Traditionally, an investment in solar energy was complex, requiring a company to make significant capital investments taking ownership

Table 3-5. Solar Energy RPS Requirements

State	Percent of Electricity from Solar				Penalties	
	2007/8	2012	2017	2022+	2007/8	2022+
Colorado	0.12	0.4	0.6	0.8	Discretionary	
District of Columbia	0.005	0.066	0.192	0.386	$300/MWh	$300/MWh
Maryland	0.005	0.06	0.55	2.0	$450/MWh	$50/MWh
Nevada	0.45	0.75	1.0	1.0	Discretionary	
New Jersey	0.0817	0.497	1.333	2.12	Discretionary	
Pennsylvania	0.0013	0.0203	0.25	0.5	200% market value of solar credits	

of technologies that were not part of its core business. For companies that had shied away from solar because of concerns about the technology and reliability of the systems, this new business model removes a layer of risk and uncertainty.

In 2007, the Maryland Renewable Energy Portfolio Standard was amended to require that Maryland's electricity suppliers purchase a certain amount of renewable energy from solar facilities each year. This new requirement, effective for the 2008 compliance year, is expected to help drive the development of new, larger, commercial solar-electric installations in Maryland. More information on the Maryland Renewable Energy Portfolio Standard is provided later in this chapter (see page 44).

The Maryland Energy Administration administers the Maryland Solar Energy Grant Program providing financial incentives to homeowners, businesses, local governments, and nonprofit organizations that install solar water-heating systems or solar-electric (PV) systems. This program, which took effect in January 2005, provides applicants up to $3,000 for solar PV and $2,000 for solar hot water systems installed at a residence, and up to $5,000 for a solar thermal or electric application at a commercial enterprise.

Supporters of solar energy look to New Jersey for a nearby example of how state renewable energy policies have stimulated investment in PV technologies. New Jersey's solar energy incentive combines a rebate program funded through the collection of a public benefits fund with a solar requirement in the New Jersey renewable energy portfolio and a high non-compliance payment for the solar renewable energy credits (SRECs). Each credit represents 1 MWh of electricity from a certified solar power source. New Jersey's SREC program creates and verifies solar certificates and allows electric suppliers to buy these certificates in order to meet their solar RPS requirements. The New Jersey Board of Public Utilities operates an on-line marketplace for trading SRECs, which began accruing from participating solar-electric facilities beginning March 2004. Most of the participating solar facilities also received a rebate from the New Jersey Customer On-site Renewable Energy Rebate (CORE) program. The programs are so popular that the budget for the 2007 CORE program is oversubscribed with more than 1,200 projects for 33 MW of solar PV and associated rebates of $115 million waiting in the project queue. Program results to date are provided in Table 3-6.

Table 3-6. New Jersey Solar Market

Year	Installed Systems	CORE Solar Rebates Paid	Installed Capacity (kW)	SRECs Traded	Average Price ($/MWh)
2001	6	$45,750	9.0	NA	NA
2002	42	$2,658,310	764.0	NA	NA
2003	56	$3,354,636	756.6	NA	NA
2004*	282	$10,917,455	2,144.1	172	$174.08
2005	493	$26,718,060	5,526.1	6,824	$188.48
2006	989	$76,408,636	17,858.2	22,987	$206.23
Total/Average	1,868	$120,102,847	27,058.2	29,983	$204.93

*SREC trading began in August 2004. A credit represents 1 MWh of solar-generated electricity.
Source: New Jersey Solar Market Update, September 2005, September 2006, and January 2007.

Hydroelectric

Hydroelectricity is energy generated by harnessing the power of moving water. Hydropower is one of the oldest sources of power, used thousands of years ago to grind grain. The first U.S. hydroelectric power plant opened in the 1880s.

While only two large-scale hydroelectric projects (greater than 10 MW capacity) are operating in Maryland, seven additional small-scale facilities also generate electricity within the state. Maryland's hydroelectric plants are listed in Table 3-7 with locations shown in Figure 3-5. Chapter 4 includes further discussion about hydroelectricity and its impacts (see page 92).

Table 3-7. Hydroelectric Projects in Maryland

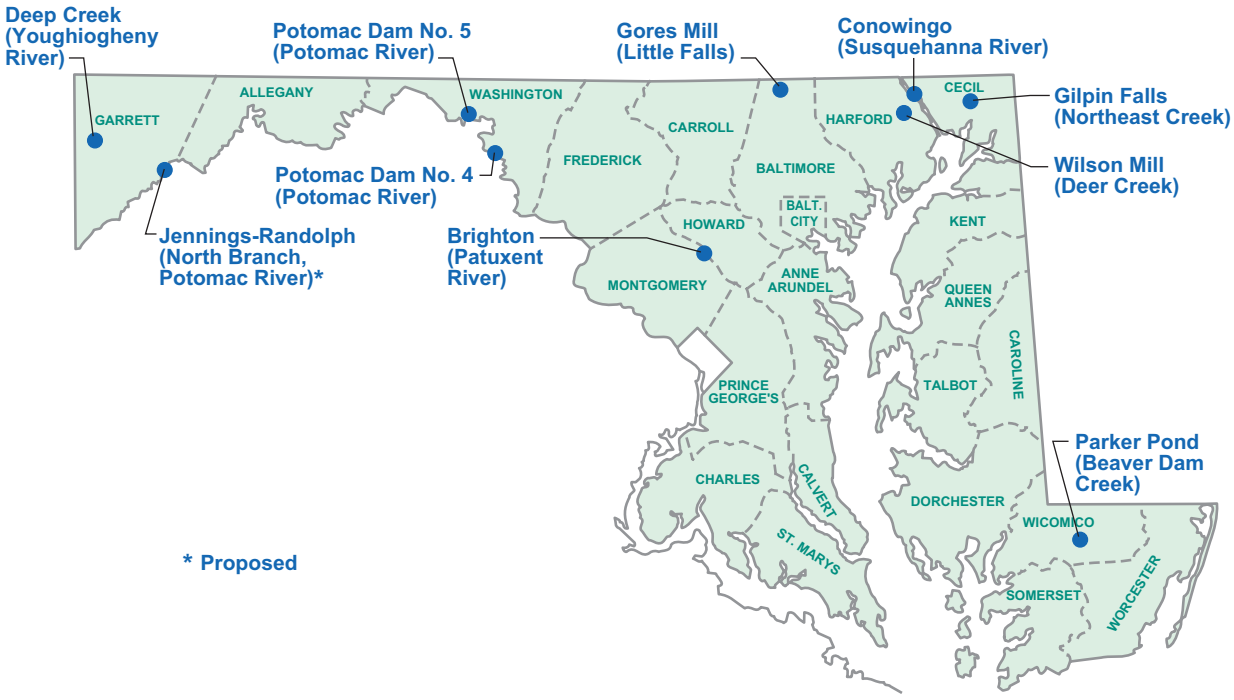
Project Name	Project Capacity (MW)	River / Location	FERC Project No.	Owner	FERC License Type	FERC License Issued	FERC License Expires	Year Operational
Brighton	0.4	Patuxent River /Clarksville, Montgomery County	3633	Alternative Energy Associated Limited Partnership	Minor License	1984	2024	1986
Conowingo	549.5	Susquehanna / Conowingo, Harford County	405	Susquehanna Power Co. and PECO Energy Power Co.	Major license	1980	2014	1928
Deep Creek	20*	Deep Creek / Oakland, Garrett County		Brookfield Power	None**			1928
Gilpin Falls	0.396	Northeast Creek / Pleasant Hill, Cecil County	3705	American Hydropower Company	License Exemption	1982	--	1984
Gores Mill	0.010	Little Falls / Baltimore County	--	C. Lintz	None	--	--	1950s
Parker Pond	0.040	Beaver Dam Creek / Wicomico County	--	W.H. Hinman	None	--	--	1950s
Potomac Dam 4	1.9	Potomac River / Shepherdstown, WV	2516	Allegheny Energy Supply	Major License	2004	2033	1909
Potomac Dam 5	1.21	Potomac River / Clear Spring, Washington County	2517	Allegheny Energy Supply	Major License	2004	2033	1919
Wilson Mill	0.023	Deer Creek / Darlington, Harford County		H. Holloway	None	--	--	1983
Jennings-Randolph (proposed)	10.5	North Branch Potomac River / Bloomington, Garrett County	12715	Fairlawn Hydroelectric at COE dam	Prelim-inary	2007	2010	(proposed)

* Nameplate capacity listed in EIA-860 database.
** Deep Creek Hydroelectric Project is administered under a Maryland water appropriations permit from MDE, which expires January 1, 2018.

Electricity Policies For Sustainability

Presently only a small amount of Maryland's electricity comes from renewable energy sources. Fossil fuels are a finite resource and continuing to rely on fossil fuel generation almost exclusively is unsustainable in the long run. Technological advancements and the use of renewable sources are necessary to support sustainable electricity generation. The State continues to evaluate policies that encourage energy innovation and renewable resource development.

Figure 3-5
Location of Hydroelectric Facilities in Maryland



Maryland RPS

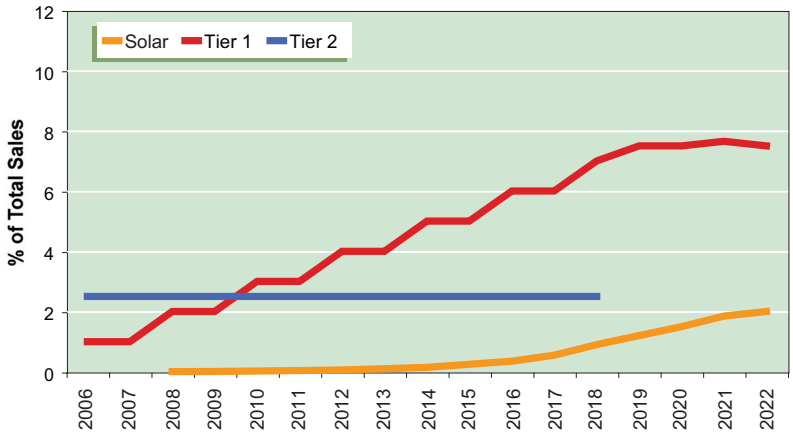
The Maryland Renewable Energy Portfolio Standard (RPS) was signed into law in May 2004. Electricity suppliers are required to purchase a certain percentage of their electricity resources from Maryland-certified Tier 1 and Tier 2 renewable resources.* Figure 3-6 illustrates the renewable shares that are required, shown as a percentage of total energy sales and increasing over time. If a supplier does not provide the required amount of renewable electricity to their customers, it must pay 2 cents for each kilowatt-hour (kWh) short of the Tier 1 resource requirement and 1.5 cent for every kWh short of the Tier 2 requirement. The first compliance year was 2006.

In April 2007, Governor Martin O'Malley signed House Bill 1016 revising the RPS to include a specific solar energy requirement. This requirement starts at 0.005 percent in 2008 and grows to 2 percent by 2022. The new legislation increased the total annual Tier 1 renewable requirement by an amount equal to the solar energy component each year — for instance, 2 percent Tier 1 plus 0.005 percent additional solar requirement for the 2008 compliance year. The non-compliance penalties for the solar energy component of the RPS start at $0.45 per kWh in 2008 and decrease $0.05/kWh every other year to be $0.05/kWh by 2023. Owners of Maryland solar power facilities must first offer their renewable energy credits for sale to a local electricity supplier, for a minimum contract

* Tier 1 renewable resources include fuel cells that produce electricity from other Tier 1 resources, geothermal, hydroelectric facilities under 30 MW, methane, ocean, qualifying biomass, solar, and wind. Tier 2 resources include municipal waste-to-energy projects, poultry litter, and existing hydroelectric facilities over 30 MW. Tier 1 resources can be used to meet the 2.5 percent Tier 2 standard.

term of 15 years, under the solar RPS legislation. Facilities with generating capacity of 10 kW or less will receive upfront a lump sum payment for the estimated output over the life of the contract.

Figure 3-6
Maryland RPS Summary



The PSC is charged with ensuring compliance with the RPS and certifying eligible facilities. Certifying a renewable energy facility requires due diligence in determining whether each facility meets the standards set forth in the Maryland RPS Program. To qualify, the facility must operate within the PJM footprint or PJM adjacent states and must be classified as a either a Tier 1 facility or Tier 2 facility. As of the end of 2006, there were 140 renewable energy facilities certified with the Maryland RPS Program providing over 3,600 MW of capacity in 12 states (see Table 3-8).

Electricity suppliers were required to submit the first year's compliance reports by April 1, 2007. A review of the reports indicates that all but one electricity supplier were in compliance with the first year's RPS requirement (see Table 3-9), with most of the Tier 1 resources coming from black liquor biomass facilities and small hydroelectric plants. Only two of the Tier 1 facilities listed as being sourced for electricity were located within Maryland; the New Page Luke Mill facility that uses black liquor, and the 20 MW Deep Creek hydroelectric plant.

Table 3-8. Maryland RPS Certified Capacity in MW

	Tier 1					Tier 2		
Facility Location	Biomass (Black Liquor)	Biomass (Wood)	Landfill Gas	Hydro (Under 30 MW)	Wind	Hydro (Over 30 MW)	Municipal Solid Waste	Total
Maryland	65			9.6		474	138.2	686.8
Delaware			775					775.0
Illinois			46.2		50.4			96.6
Michigan		81.3	36.2					117.5
New Jersey			44.6				14	58.6
New York				495		150.9		645.9
North Carolina		50	5.3					55.3
Ohio	92.8	16.5						109.3
Pennsylvania		16.2	60	42.7	88.5	352.1	84.7	644.2
Tennessee			3.2					3.2
Virginia	89.6	94.9	9.4	7.5			60	261.4
West Virginia				6	66	168.8		240.8
Total	247.4	258.9	979.9	560.8	204.9	1145.8	296.9	3694.6

Source: Maryland Public Service Commission Renewable Energy Portfolio Standard Report of 2007.

Note: In Maryland, the certified hydroelectric capacity resources consist of Deep Creek (Tier 1, under 30 MW) and Conowingo (Tier 2, over 30 MW). The RPS certified capacity for these hydroelectric facilities is lower than their rated capacities (shown in Table 2-1 of this document) because the certified capacity reflects the actual amount of generation over the course of the year. Since the facilities do not produce their full output 100 percent of the time, the certified capacity is less than the rated capacity.

Table 3-9. 2006 RPS Compliance

Company	Total Eligible Load Served (MWh)	RPS Requirement (MWh)		Source	
		Tier 1 RECs	Tier 2 RECs	Tier 1	Tier 2
Allegheny Power	1,841,027	18,410	46,026	Multiple Out of State	Multiple Out of State
American PowerNet Management	200,730	2,007	5,018	Luke Paper	Luke Paper, 86% SPSA Waste to Energy, MSW, VA
Berlin Electric Plant*	38,120	381	953	Noncompliant	Noncompliant
BGE	13,300,582	133,005	332,514	Luke Paper, 32% Multiple Out of State	NMWDA, 3% Multiple Out of State
BlueStar Energy Services*	19,861	198	496	Noncompliant	Noncompliant
Commerce Energy	51,812	518	1,295	Luke Paper	Luke Paper
ConEdison	698,572	6,985	17,464	Franklin Mill, BLQ, VA	Franklin Mill, BLQ, VA
Constellation New Energy	4,872,745	48,727	121,819	Franklin Mill, BLQ, VA	Safe Harbor Water, WAT, PA
Delmarva Power	3,235,840	32,358	80,896	Multiple Out of State	NMWDA, 25% Multiple Out of State
Direct Energy Services	648,701	6,487	16,217	Primary Power, WDS, MI	Primary Power, WDS, MI
Dominion Retail	2,957	29	73	Trenton, WAT, NY	School Street, WAT, NY
Easton Utilities	261,667	2,616	6,541	Primary Power, WDS, MI	NMWDA
FirstEnergy Solutions	386,336	3,863	9,658	Luke Paper, 9% Trenton, WAT, NY	School Street, WAT, NY
Hagerstown Light	183,390	1,833	4,584	PE Hydro, WAT, WV	Lake Lynn, WAT, WV
Liberty Power	31,577	315	789	MeadWestVaco, BLQ, VA	Gualy River Power, WAT, WV
MidAmerican Energy	25,780	267	644	Franklin Mill, BLQ, VA	School Street, WAT, NY
Pepco	8,626,350	86,263	215,658	Deep Creek, <0.01% Luke Paper, 35% Multiple Out of State	NMWDA, 8% Multiple Out of State
Sempra Energy Solutions	324,862	3,248	8,120	Coshocton Mill, WAT, OH	Coshocton Mill, WAT, OH
Southern Maryland Electric Cooperative	2,831,426	28,314	70,785	MeadWestVaco, BLQ, VA	Safe Harbor, WAT, PA
Strategic Energy	195,323	1,953	4,883	MeadWestVaco, BLQ, VA	SPSA Waste to Energy, MSW, VA
Suez Energy Resources	377,103	3,771	9,428	Viking Energy, WDS, PA	School Street, WAT, NY
Thurmont	43,123	431	1,078	PE Hydro, WAT, WV	Lake Lynn, WAT, WV
UGI Energy Services	42,105	421	1,052	Edge Moor, LFG, DE	Edge Moor, LFG, DE
Washington Gas Energy Services	2,335,425	23,354	58,386	Primary Power, WDS, MI	Safe Harbor Water, WAT, PA
Williamsport	10,296	102	257	PE Hydro, WAT, WV	Lake Lynn, WAT, WV
Total Load/ Requirement	**40,585,674**	**434,171**	**1,085,419**		
Total RECs Retired*		**433,592**	**1,083,970**		

* Berlin Electric Plant and BlueStar Energy Services did not retire any RECs for compliance with the RPS, but instead paid the alternative compliance payment.

NMWDA: Northeast Maryland Waste Disposal Authority
BLQ: Black Liquor
LFG: Landfill Gas
MSW: Municipal Solid Waste
WDS: Woodwaste
WAT: Hydro
Source: Maryland Public Service Commission annual RPS compliance reports.

Demand Side Resources

With the move to retail competition and electricity restructuring, Maryland investor-owned utilities phased out nearly all of the demand side management programs that characterized utility resource plans throughout the late 1980s and early to mid-1990s. The view of most utilities and the PSC was that the newly developed retail electricity supply market would include a range of energy efficiency and demand side management initiatives as part of suppliers' competitive service offerings. However, below-market retail electricity prices and low rates of customer switching provided few incentives for the development of demand side service offerings on the part of retail electricity suppliers.

Energy Efficiency

For nearly a decade, Maryland's investment in energy efficiency has lagged other states that have more aggressive policies. Notably, comparing per capita electricity consumption over 30 years demonstrates the relative efficiency of Maryland versus states that have invested significant amounts of money in cost-effective energy projects see (Figure 3-7).

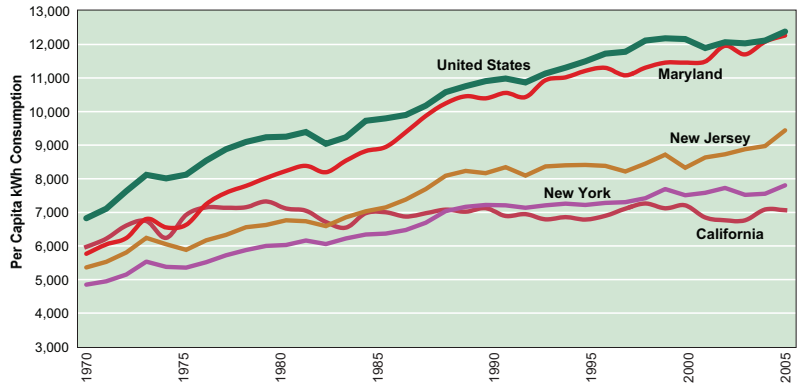
The American Council for an Energy Efficient Economy grades each state on its progress in eight different categories of energy efficiency. Maryland ranks in the top half due mostly to its policies on building codes and transportation. However, Maryland receives a score of zero for both utility spending on energy efficiency and energy efficiency resource standards (see Table 3-10). The leading states in energy efficiency spend between 1 and 2 percent of utility revenues on energy efficiency programs (Table 3-11). These expenditures are generally recovered through utility rates or designated system benefits charges. For comparison, were Maryland to institute a policy of funding energy efficiency programs through utility rates at 1 to 2 percent of utility revenues (see Table 3-11), approximately $57 million per year might be available for utility energy efficiency programs. Utility spending on and administration of demand side management programs is an issue currently under review by the PSC and the Maryland Energy Administration.

Demand Response

The successful implementation of demand response initiatives will help to reduce the peak demand of the PJM electricity markets, reducing hours with high spot market prices and contributing to an overall reduction in wholesale and retail electricity prices. Additionally, reducing peak demand in Maryland, and systemwide, may reduce the need for investments in power plants primarily used during peak demand.

Maryland industrial, commercial, and a few residential customers already participate in demand response activities as part of one or more programs offered by Maryland utilities, PJM, and third party curtailment service providers. A certain level of demand response is included in the PJM load forecast; however, recent policies and directives put forward by both federal and State legislative and regulatory agencies aim to increase the amount of energy resources provided through demand response activities.

Figure 3-7
Electricity Consumption per Capita



Source: EIA and US Census

Table 3-10. State Energy Efficiency Scorecard for 2006 - Top 25 States

Rank	State	Utility Spending on Energy Efficiency	Energy Efficiency Resource Standards	Combined Heat & Power	Building Codes	Transportation Policies	Appliance Standards	Tax Incentives	State Lead by Example	TOTAL SCORE
	Maximum Points:	***15***	***5***	***5***	***5***	***5***	***3***	***3***	***3***	***44***
1	Vermont	15	5	3	3	4	2	0	1	33
1	Connecticut	11	5	5	4	4	1	2	1	33
1	California	7	5	5	5	3	3	2	3	33
4	Massachusetts	13.5	0	4	2.5	4	2	1	2	29
5	Oregon	11.5	0	4	4	3	2	3	0.5	28
6	Washington	9.5	3	3	4	4	2	1	0.5	27
7	New York	5	0	5	3	5	2	2	3	25
8	New Jersey	7	1	5	2.5	4	1	0	1.5	22
9	Rhode Island	8.5	0	1	4	4	2	0	0.5	20
9	Minnesota	7	3	3	4	2	0	0	1	20
11	Texas	2	5	4	4	1	0	0	1.5	17.5
12	Wisconsin	6.5	0	3	3	2	0	0	2.5	17
13	Iowa	6.5	0	2	4	1	0	0	3	16.5
14	Pennsylvania	0	3	4	4	4	0	0	1	16
15	Colorado	1.5	5	3	3	0	0	1	2	15.5
15	Maine	6.5	0	2	2	4	0	0	1	15.5
18	Hawaii	4.5	3	3	2	1	0	0	2	15.5
18	New Hampshire	7.5	0	1	3	1	0	0	2	14.5
18	Nevada	2	5	2	4	0	0	1	0.5	14.5
20	**Maryland**	**0**	**0**	**2**	**4**	**4**	**1**	**1**	**2**	**14**
21	Montana	5.5	0	0	4	0	0	3	0.5	13
22	District of Columbia	2.5	0	0	4	1	0	3	2	12.5
23	Arizona	0.5	0	2	3	1	2	1	2	11.5
24	New Mexico	0.5	0	3	4	1	0	1	1.5	11
25	Idaho	3	0	2	4	0	0	1	0.5	10.5

Source: American Council for An Energy Efficient Economy, June 2007

Green Power Purchases

In recent years, Maryland has purchased green power resources as part of its electricity procurement process. The motivation for the initial green power procurement came as a response to a 2001 executive order from then-Governor Parris Glendening to set a goal of 6 percent green electricity for state facilities. In July 2006, then-Governor Robert Ehrlich revised this goal and committed the State to obtaining 10 percent of its electricity supply from Tier 1 resources. To date, the Maryland Department of General Services has held four auctions that were successful in obtaining green power supplies (see Table 3-12).

County Green Power Purchases

In January 2004, Montgomery County issued a Request for Proposals (RFP) for the "Supply of Electricity and Related Services for Montgomery County and County and Bi-County Agencies and Jurisdictions." In addition to addressing electricity supply for most county facilities, the RFP covered several local towns and cities, the Washington Suburban Sanitary Commission, and the Maryland National Park and Planning Commission.

The County specified that the successful bidder must deliver wind generation to the PJM grid. The RFP also required that all environmental attributes related to the wind power, including any NO_x certificates or allowances, be transferred to Montgomery County and its partners. Washington Gas Energy Services was selected as the winning bidder, sourced from the 66 MW Mountaineer Wind Energy Center in Thomas, West Virginia. In 2006 the County increased its share of wind energy to 10 percent, now purchasing approximately 35 percent of Mountaineer's yearly output, and has set a goal of reaching 20 percent wind power by 2010. Table 3-13 shows the Montgomery County

Table 3-11. Utility Spending on Energy Efficiency

	Total Spending (thousand dollars)	% of Annual Utility Revenues*
Vermont	$14,000	2.2
Oregon	$62,888	2.2
Massachusetts	$133,326	2.2
Washington	$88,522	1.9
Connecticut	$58,098	1.8
Rhode Island	$13,990	1.6
Minnesota	$55,784	1.4
California	$380,009	1.3
New Hampshire	$15,120	1.2
Utah	$16,450	1.2
New Jersey	$92,753	1.2
Wisconsin	$53,754	1.1
Iowa	$28,833	1.1
Maine	$13,118	1.1
Montana	$8,002	1.0

Note: Maryland utilities have not administered or funded energy efficiency programs since 2000. However, Maryland initiated new utility energy efficiency programs as of October 2007. Information is not yet available on the amount of spending relative to utility revenues.

* Revenues exclude wholesale and retail sales of electricity and include only those revenues associated with transmission and distribution services.

Table 3-12. State Green Power Purchases

Contract Start Date	Length (months)	Territory	Total MWh/year Purchased	MWh/year of Green Power	Percent of Total
July 2002	24	BGE	1,600,000	96,000	6
October 2003	29	Conectiv	106,000	6,400	6
July 2004	24	BGE	862,000	112,000	13
January 2007	24	All	1,479,000	3,900	0.3

Source: Communications with Maryland Energy Administration and Department of General Services, June 2007.

Note: The January 2007 auction resulted in a much smaller amount of renewable energy, as a percentage of total electricity purchased, because it was the first of these green power auctions that required successful bids to be least cost. Very few renewable energy contracts met the least cost criterion.

purchasing group's aggregate wind power purchases. Montgomery County has also created an incentive mechanism for consumers to purchase green power called the Clean Energy Rewards program. This program offers a rebate of 1 cent per kWh to residents and 1.5 cents per kWh to businesses and organizations for purchases of eligible renewable energy.

Table 3-13. Montgomery County Group Wind Purchases

Contract Start Date	Length (months)	Total MWh/ year	MWh/year Wind Power	Percent of Total
July 2004	12	768,000	38,412	5 %
August 2005	12	817,000	40,845	5 %
September 2006	24	860,000	55,578	10% for Montgomery County and some other participants, 5% for others

Water Agency Purchasing Green Power

The Washington Suburban Sanitary Commission (WSSC), which supplies water and sewer services to Montgomery and Prince George's County customers, participated in the Montgomery group contracts for 2004 through to the end of the current contract in September 2008. However, WSSC announced in December 2006 that it has negotiated a 10-year wind power purchase agreement with Constellation Energy Projects & Services Group sourced from a proposed wind farm to be constructed in Somerset County, Pennsylvania. WSSC will be buying approximately 70,000 MWh per year, amounting to 85 percent of the output from the Forward Wind Power Project in Shade Township, and providing for one-third of WSSC's electricity needs. The contract consists of a fixed price over the 10-year span and WSSC estimates it will save $20 million in energy costs over the life of the contract. The water utility will buy additional electric capacity through the wholesale market. WSSC's wind power purchase will serve as a hedge against volatility by providing price stability in one-third of the agency's power supply.