Chapter 2 – Power Generation, Transmission, and Use

We call that fire of the black thunder-cloud "electricity," and lecture learnedly about it, and grind the like of it out of glass and silk: but what is it? What made it? Whence comes it? Whither goes it?

- Thomas Carlyle
The Carlyle Anthology (1876)

As a basis for discussing the impacts of power plants in Maryland, it is helpful to understand how electricity is generated, transmitted, and used within the state. This chapter provides information on the electric industry in Maryland, from generation to end usage, as well as how supply and demand dynamics affect price.

2.1 Electricity Generation in Maryland

Currently in Maryland, 38 power plants with generation capacities greater than 2 megawatts (MW)[1] are interconnected to the transmission grid. The individual power plant sites are listed in Table 2-1 and locations are shown in Figure 2-1. In aggregate, Maryland power plants represent approximately 13,500 MW of operational capacity. The largest portion of Maryland's generating capacity comes from fossil fuel (see Figure 2-2), with the remainder coming from nuclear and renewables.

2.1.1 Fossil Fuels

Fossil fuel-fired power plants comprise approximately 80 percent of Maryland's total installed capacity. The primary fuel used for electricity production in Maryland is coal.

Coal

Of the eight power plants in Maryland that burn coal, only one of them — Warrior Run — primarily uses coal mined in Maryland. A portion of the coal burned at the R.P. Smith plant also comes from Maryland mines, supplemented by Pennsylvania coal. Most Maryland power plants cannot efficiently burn coal mined in the state because they were designed for coal with higher volatility characteristics. Based on 2008 data (the most recent figures available), more than 50 percent of the coal burned in Maryland plants was mined in West Virginia. Going forward, compliance with the Maryland Healthy Air Act (HAA) regulations will likely include the increased use of sub-bituminous coal, largely from the Powder River Basin in Wyoming and Montana, which typically has a lower sulfur content than bituminous coal. Table 2-2 lists the amount of coal purchased at each power plant and the state or country of origin.

Natural Gas

In 2007, approximately 23 billion cubic feet of natural gas was used for electricity generation in Maryland, representing 11.5 percent of total statewide consumption for all uses. Currently, Maryland receives bulk natural gas from several pipelines that traverse the state

[1] 2 MW is equal to 2 million watts, enough power to meet the simultaneous peak demand of about 500 homes.

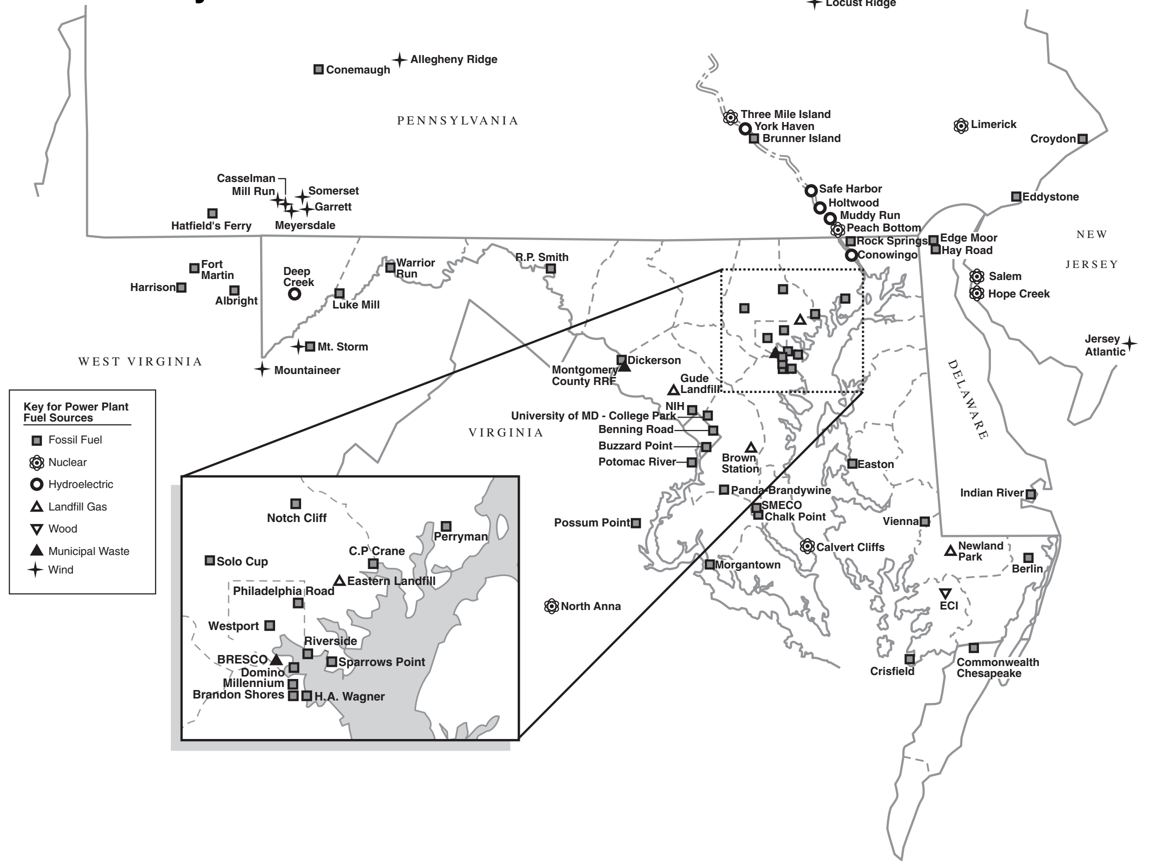
Table 2-1 Operational Generating Capacity in Maryland (>2 MW)

Owner	Plant Name	Fuel Type	Nameplate Capacity (MW)
INDEPENDENT POWER PRODUCERS			
AES Enterprise	Warrior Run	Coal	229
Allegheny Energy Supply	R. P. Smith	Coal	110
Baltimore Refuse Energy Systems Co.	BRESCO	Waste	65
Brookfield Power	Deep Creek	Hydroelectric	20
Conectiv Energy Supply	Crisfield	Oil	10
Constellation Generation Group	Brandon Shores	Coal	1,370
	Calvert Cliffs	Nuclear	1,829
	C. P. Crane	Coal	416
	Notch Cliff	Natural Gas	144
	Perryman	Oil/Natural Gas	404
	Philadelphia Road	Oil	83
	Riverside	Oil/Natural Gas	244
	H. A. Wagner	Coal/Oil/Natural Gas	1,059
	Westport	Natural Gas	121
Exelon Generation Company, LLC	Conowingo	Hydroelectric	550
INGENCO	Newland Park Landfill	Landfill Gas/Diesel	6
Mirant	Chalk Point	Coal/Natural Gas	2,563
	Dickerson	Coal/Natural Gas	930
	Morgantown	Coal	1,548
Montgomery County	Resource Recovery Facility (RRF)	Waste	68
	Gude Landfill	Landfill Gas	3
NRG	Vienna	Oil	183
Panda Energy	Brandywine	Natural Gas	289
Pepco Energy Services	Eastern Landfill	Landfill Gas	4
	National Institutes of Health	Natural Gas	23
Prince George's County	Brown Station Road	Landfill Gas	7
Suez Energy North America	Millennium Hawkins Point	Oil/Natural Gas	11
	University of Maryland – College Park	Oil/Natural Gas	27*
PUBLICLY OWNED ELECTRIC COMPANIES			
Berlin	Berlin	Oil	9
Easton Utilities	Easton	Oil	69*
Old Dominion Electric Cooperative	Rock Springs	Natural Gas	770
Southern Maryland Electric Cooperative	Chalk Point Turbine	Natural Gas	84
SELF-GENERATORS			
American Sugar Refining Co.	Domino Sugar	Oil/Natural Gas	18
MD Department of Public Safety and Corrections	Eastern Correctional Institution (ECI) Cogeneration Facility	Wood Waste	4
Severstal	Sparrows Point	Natural Gas/Blast Furnace Gas	120
New Page	Luke Mill	Coal/Black Liquor	65
Solo Cup	Solo Cup – Owings Mills	Natural Gas	11
Total			**13,466**

* Facilities comprised of multiple units, with each individual unit less than 25 MW.

Note: Facilities listed are all interconnected to the electricity grid, export power to the grid, and were required to obtain a CPCN.

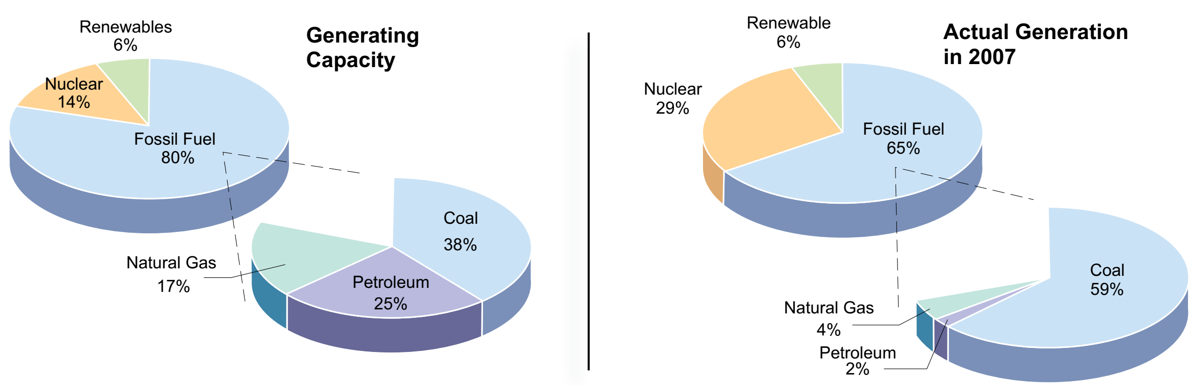
Figure 2-1 Power Plant Locations In and Around Maryland



(see Figure 2-3). 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, with a storage capacity representing 2 percent of the underground gas storage capacity in our region (the states of Maryland, New Jersey, Pennsylvania, Virginia, and West Virginia). Other potentially suitable sites may exist in Western Maryland.

Rising natural gas prices during the last decade has stimulated the construction of new terminal capacity to import liquefied natural gas (LNG). Natural gas wellhead prices were

Figure 2-2 Power Plant Capacity and Generation in Maryland by Fuel Category



Source: Energy Information Administration

Table 2-2 Tons of Coal Purchased at Maryland Power Plants in 2008

Origin of Coal	Brandon Shores	H.A. Wagner	C.P. Crane	Morgan-town	Chalk Point	Dickerson	Warrior Run	R. Paul Smith	Total By State/ Country	% By State/ Country
West Virginia	3,039,104	650,875	76,392	836,691	1,036,198	855,264			6,494,525	54.29%
Pennsylvania			547,807	1,435,534	678,984	237,409	59,763	205,499	3,164,997	26.46%
Kentucky	142,390	181,297		528,403					852,090	7.12%
Maryland							694,077	85,411	779,488	6.52%
Columbia	145,385			262,913					408,298	3.41%
Wyoming		65,339	197,224						262,563	2.19%
Total by Plant	**3,326,879**	**897,511**	**821,423**	**3,063,541**	**1,715,183**	**1,092,674**	**753,840**	**290,910**	**11,961,961**	

Note: Brandon Shores, H.A. Wagner, C.P. Crane and Warrior Run data represents total coal consumed during 2008.

Figure 2-3 Interstate Natural Gas Pipelines in Maryland

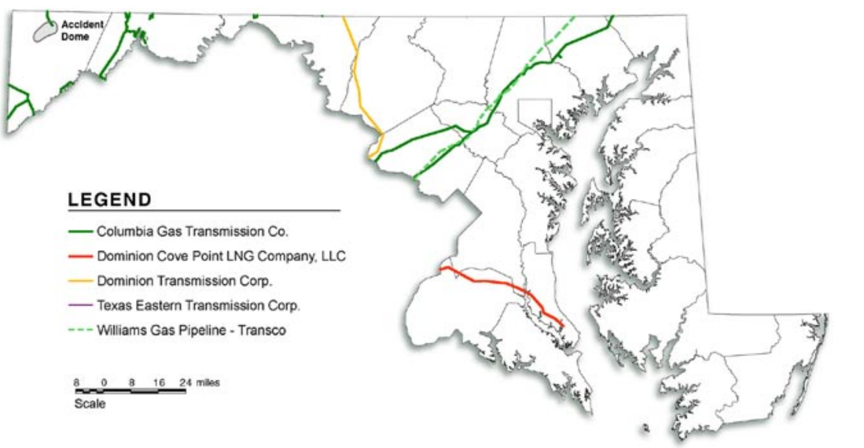
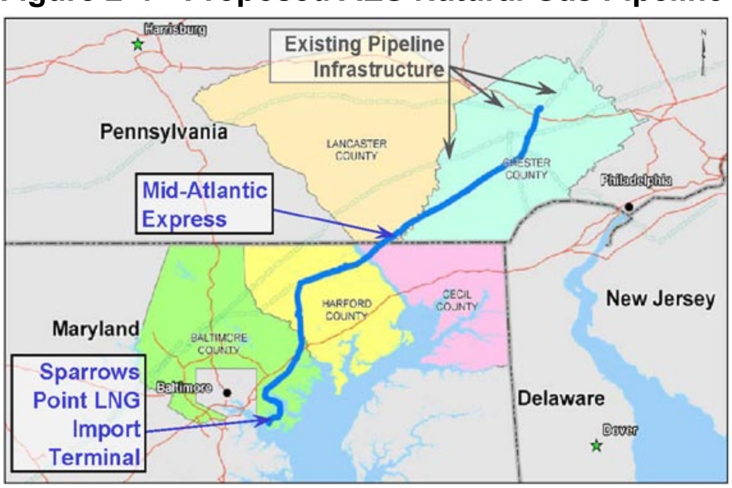


Figure 2-4 Proposed AES Natural Gas Pipeline



Source: http://www.aessparrowspointlng.com

in the range of $2.00 per thousand cubic feet throughout the 1990s, then started a steady increase, doubling to $4.00 by 2001 and reaching a high of $10.82 in mid-2008 (see Figure B-4 in Appendix B for more information on fuel prices). Due to the economic slowdown, natural gas prices have been decreasing since June 2008 and were an average of $4.79 for the first half of 2009.

In Maryland, the Cove Point facility, one of nine existing U.S. LNG import facilities, began accepting new deliveries of LNG in the late summer of 2003 and in March 2009 completed an expansion that nearly doubled the capacity of the facility to an output of 1.8 billion cubic feet per day. The Cove Point facility receives LNG imports from several different countries. Currently, Cove Point sources are Egypt, Norway, and Trinidad and Tobago.

In January 2009, the Federal Energy Regulatory Commission (FERC) approved the AES Sparrows Point LNG Terminal and Mid-Atlantic Express Pipeline project (Figure 2-4). The project will be able to store an estimated 17 million cubic feet of LNG at the terminal, and vaporize and inject approximately 1.5 billion cubic feet per day of natural gas into the Northeastern U.S. pipeline system. The capability to import LNG expands the potential sources of supply, which would otherwise be limited to reserves in the United States and Canada.

Petroleum

A small amount of electricity — approximately 2 percent of the state's total — is generated by combusting distillate or residual fuel oil. According to the EIA, fuel oil consumption for electric power in Maryland totaled 78.4 million gallons for 2007, or about 7.9 percent of statewide consumption for all uses. Since there are no crude oil reserves or refineries in Maryland, all supplies of petroleum necessary to meet the state's consumption needs are 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.

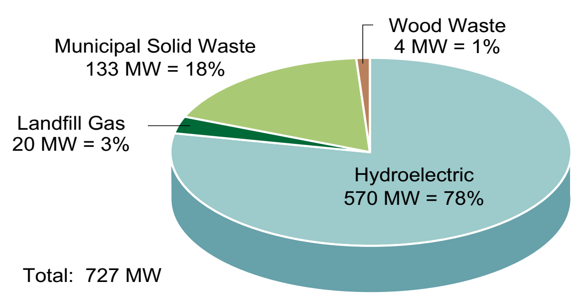
2.1.2 Nuclear

Maryland is home to one nuclear power facility, Constellation Energy's Calvert Cliffs plant. In March of 2000, the U.S. Nuclear Regulatory Commission (NRC) approved a 20-year extension to the original operating licenses for Units 1 and 2. The units' licenses will expire in 2034 and 2036, respectively. This 1,829 MW facility represents approximately 14 percent of the state's total electricity generation capacity and accounted for more than one fourth of the state's total generation in 2007. UniStar Nuclear, a partnership between Constellation Nuclear and Électricite de France (EDF), a large, European-based energy company, has received a Certificate of Public Convenience and Necessity (CPCN) from the Maryland Public Service Commission (PSC) and has applied for a license from NRC to add a third unit at the Calvert Cliffs site (see Section 2.2.1).

2.1.3 Renewable Resources

Presently, there are four types of renewable resources in use or under consideration in Maryland: wind, bio-based, solar, and hydropower. Approximately 727 MW of generation capacity in Maryland comes from renewable resources, with hydroelectric accounting for the largest share (see Figure 2-5).

Figure 2-5 Renewable Capacity in Maryland



Note: Figure does not include black liquor, a biomass-based fuel that is co-fired with coal at the New Page facility in Luke, MD.

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 incorporating a commercially available software package called WindFarm©.

WindFarm© is used 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 (MEA) 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 the total onshore wind resource capability in Maryland to be between 627 MW and 1,078 MW. Figure 2-6 illustrates the prospective wind resource areas in Maryland that were evaluated in the analysis.

Proposed Maryland Onshore Wind Projects

Five onshore wind projects in western Maryland have been announced, representing a total capacity of about 290 MW (see Table 2-3 and potential sites noted in Figure 2-7). However, each of them has faced various challenges and none have yet begun construction. The PSC granted CPCNs to two of the projects, and a PSC Hearing Examiner recommended granting a CPCN to a third. The Maryland General Assembly passed legislation in 2007 allowing new wind power facilities equal to or less than 70 MW in capacity to request an exemption from the CPCN requirement if:

Figure 2-6 Maryland Wind Resource Areas

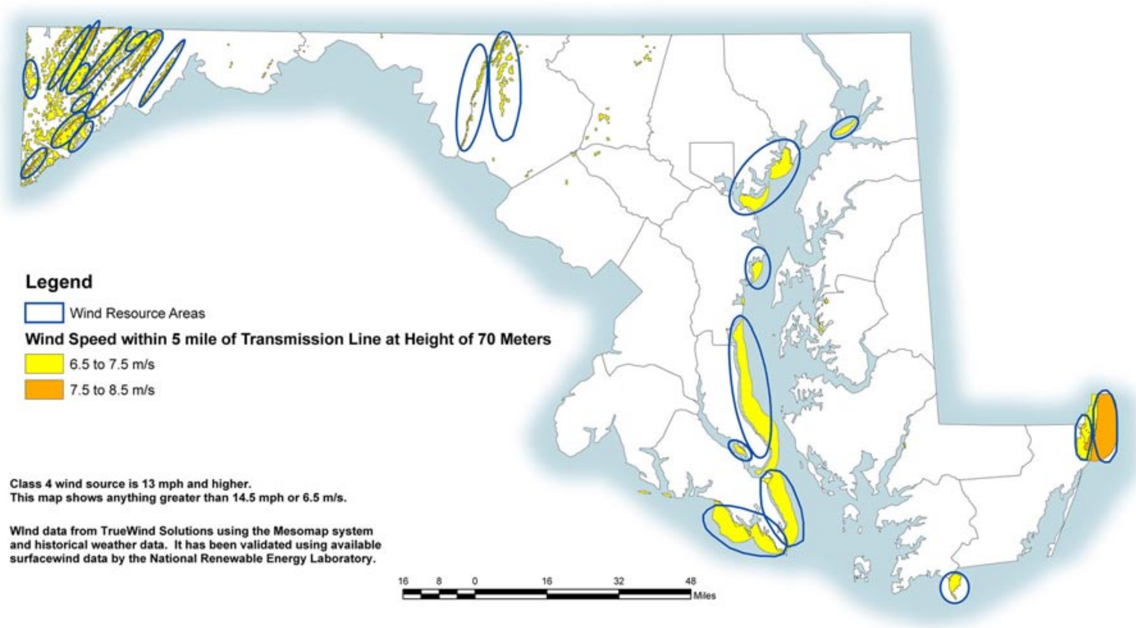


Table 2-3 Proposed Wind Power Projects in Maryland

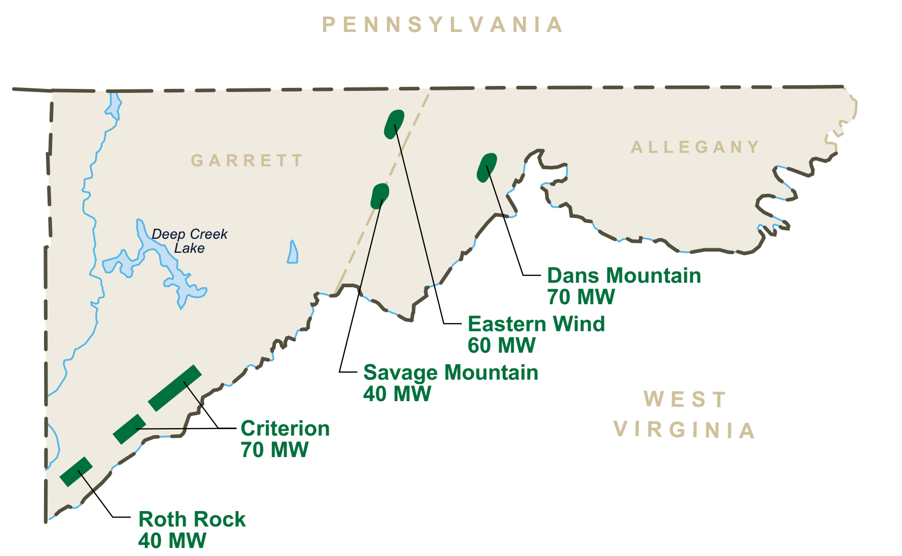
Project - Developer Name	Proposed Size (MW)	Location	Nearest Town	Status
Criterion – Clipper	70	Backbone Mountain	Oakland	Received CPCN exemption
Savage Mountain – U.S. WindForce	40	Savage Mountain	Lonaconing	CPCN was extended to March 2010
Roth Rock – Synergics	50	Backbone Mountain	Oakland	Filed for a CPCN exemption
Dans Mountain – U.S. WindForce	70	Dans Mountain	LaVale	Received CPCN exemption
Eastern Wind – Synergics	60	Four-Mile Ridge	Frostburg	In early planning phase

- *The wind plant is located on land;*
- *The electricity output is sold only on the wholesale market under an interconnection, operating, and maintenance agreement with the local utility; and*
- *The Commission allows for public input at a public hearing.*

Such facilities will still be subject to any federal, State, and local approvals needed to address (among other things) erosion and sediment control, Federal Aviation Administration lighting requirements, and threatened and endangered species impacts.

A separate proposal from U.S. WindForce to construct up to 100 wind turbines in the Savage and Potomac State forests was halted after the State held two public hearings and received about 1,400 comments, the vast majority of which were opposed to allowing wind development on State-owned lands. Subsequently, Governor O'Malley announced he will not permit wind development on State-owned lands.

Figure 2-7 Approximate Locations of Proposed Wind Energy Projects



Clipper Windpower's Criterion project on Backbone Mountain in Garrett County originally received a CPCN for a 101 MW project in 2003, but Clipper later reduced the size of the project to 70 MW and filed for an exemption. This project was the first to receive the CPCN exemption and would consist of 28, 2.5 MW turbines, if constructed. U.S. WindForce also received a CPCN in 2003 for its Savage Mountain project near Lonaconing, but the project has been delayed. U.S. WindForce is also developing the 69.6 MW Dans Mountain project near LaVale and was granted a CPCN exemption in 2009 for that project.

Synergics proposed a 40 MW Roth Rock project in 2005, close to Clipper's proposed project and 1.5 miles from the border of Maryland and West Virginia. A PSC hearing examiner recommended granting a CPCN in 2006. Following the legislation in 2007, Synergics withdrew its original CPCN application and in April 2009 filed for a CPCN exemption for a 50 MW project. Synergics has a power purchase agreement with Delmarva Power and Light for Roth Rock and for the proposed 60 MW Eastern Wind project near Frostburg.

Offshore Wind

Eight countries now have offshore wind plants providing energy to their grids – Denmark, Belgium, Sweden, Finland, Germany, the United Kingdom, the Netherlands, and Ireland. In total, there are 33 offshore wind projects representing 1,471 MW of generation capacity. The American Wind Energy Association lists the following advantages to developing wind offshore:

- *Can use larger turbines because transport over water is easier.*
- *Wind resources are steadier and wind speeds higher.*
- *Offshore wind in the U.S. is closer to population centers reducing the cost of transmission.*
- *Offshore wind could spur economic activity (parts manufacture and/or assembly, and transport) and create green jobs in coastal areas.*
- *Some states with limited onshore wind resources have significant offshore wind resources, especially in the Northeast.*
- *Environmental impacts are limited with the foundations creating artificial reefs and European studies indicating birds avoid the wind farms.*

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. However, FERC has authority over "hydrokinetic" projects – tides, currents, and waves, and there has been some overlap in applications for permits between the two agencies. On April 9, 2009, MMS and FERC announced that they had reached an agreement clarifying their agencies' jurisdictional responsibilities over offshore renewable energy development. Under the agreement:

- *MMS has exclusive jurisdiction with respect to non-hydrokinetic projects, including the issuing of leases, easements, and rights-of-way, and will conduct all environmental reviews, but construction cannot begin until the company has received a license (or exemption) to construct from FERC; and*
- *FERC will have exclusive jurisdiction to issue licenses (and exemptions) for all hydrokinetic projects and will conduct all environmental reviews, but companies will be required to first obtain a lease through MMS.*

On April 22, 2009, MMS announced that it had finalized a framework for renewable energy production on the OCS. The framework establishes a process for granting leases, easements, and rights-of-way for offshore renewable energy projects and methods for sharing revenue with adjacent coastal states.

Offshore wind power facilities have been proposed for development off both the Pacific and Atlantic Coasts (also in the Great Lakes), including off Delaware, Maryland, and Virginia. The turbines would be located in federal waters and at least six miles off shore. Table 2-4 shows the offshore wind plants proposed near Maryland that have made some progress. Bluewater Wind has also proposed building an offshore wind plant off Maryland's eastern shore, out from Ocean City.

Table 2-4 Proposed Offshore Wind Facilities Near Maryland

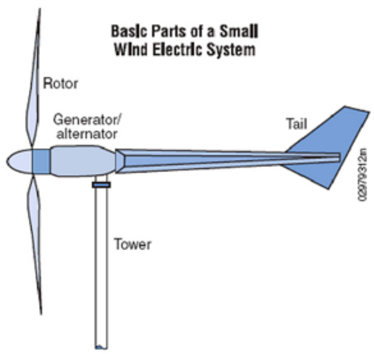
Project	Location	Size	Status
Bluewater Wind	Delaware	Up to 600 MW	Permitting/development underway, 25 year PPA with Delmarva Power for 300 MW.
Bluewater Wind	New Jersey	348 MW	Receiving $4 million grant from NJ BPU for meteorological towers.
Fisherman's Energy	New Jersey	350 MW	Receiving $4 million grant from NJ BPU for meteorological towers.
Garden State Offshore Energy	New Jersey	300 MW	Winning bid from NJ Offshore Wind RFP, receiving $4 million grant for meteorological towers.

Source: Offshore Wind website: http://offshorewind.net/

Small Wind in Maryland

Small wind turbines range in size from 20 watts to 100 kilowatts (kW). The smaller turbines (20- to 500-watt) are considered micro turbines and mostly used for small-scale specific applications such as charging batteries for recreational vehicles and sailboats. Turbines used in residential applications are typically sized from 400 watts to 100 kW, depending on the amount of electricity needed. A typical home uses approximately 10,000 kilowatt-hours (kWh) of electricity annually, or about 830 kWh per month. A wind turbine with a capacity of about 15 kW would provide approximately 300 kWh per month in a location with a 14 mile-per-hour annual average wind speed. The Maryland Environmental Service and MEA have an Anemometer Loan Program that lends wind measuring devices to locations interested in installing a small wind system. The anemometer data assesses the wind

Small Wind System



Home wind energy systems generally comprise a rotor, a generator or alternator mounted on a frame, a tail (usually), a tower, wiring, and the "balance of system" components: controllers, inverters and/or batteries.

Through the spinning blades, the rotor captures the kinetic energy of the wind and converts it into rotary motion to drive the generator. The amount of power a turbine will produce is determined primarily by the diameter of its rotor. The diameter of the rotor defines its "swept area," or the quantity of wind intercepted by the turbine. The turbine's frame is the structure onto which the rotor, generator, and tail are attached. The tail keeps the turbine facing into the wind. In general, the higher the tower, the more power the wind system can produce. Relatively small investments in increased tower height can yield very high rates of return in power production. For instance, to raise a 10 kW generator from a 60-foot tower height to a 100-foot tower involves a 10 percent increase in overall system cost, but it can produce 29 percent more power.

Source: DOE – EERE, Small Wind Electric Systems, A Maryland Consumers Guide.

resource at that particular site to allow a determination of whether it is suitable for a small wind turbine.

Windswept Grant Program

MEA launched the Windswept Grant Program in November 2007. The program provides grants to individuals, businesses, and local governments to offset the cost of installing a small wind system. In 2008, the grant amount was $1,500 per kW with a maximum of $3,000 per residential system and $5,000 per non-residential system. For 2009, the grant amount was increased to $2,500 per kW with a maximum of $10,000 for both residential and non-residential projects. Table 2-5 shows the grants awarded for 2008 and 2009, and the status of the projects as of January 2009. The program has provided nearly $50,000 in total grants.

Table 2-5 Windswept Grant Program

	Projects Approved for Grants				Projects Completed					
Fiscal Year	Total	Res.	Com.	Local Govt.	Total	Res.	Com.	Local Govt.	Planned Capacity (kW)	Completed Capacity (kW)
2008	9	8	0	1	9	8	0	1	16.2	16.2
2009	7	5	1	1	3	3	0	0	32.2	21.8

Source: Maryland PSC, Annual Report on the Status of Wind-Powered Generating Stations In the State of Maryland, February 1, 2009.

Cape Wind Project

Energy Management, Inc. is attempting to build the Cape Wind Project, America's first offshore wind plant on Horseshoe Shoal in Nantucket Sound off the coast of Cape Cod. The project will be over five miles from Hyannis and even further from most Cape Cod beaches. The developers plan to paint the supporting towers to blend in with the sea and sky, making them visible only a half-inch above the horizon on clear days. It will consist of 130 wind turbines and produce up to 420 MW of renewable energy. In average winds, Cape Wind will provide three quarters of the Cape and Islands electricity needs. In February 2009 MMS issued a mostly positive environmental review and in March the Massachusetts Energy Facilities Siting Board voted to grant Cape Wind a Certificate of Environmental Impact and Public Interest that effectively combines all nine state and local permits related to the project's transmission lines into one "composite certificate". The Cape Wind Project has been fiercely opposed by a coalition of influential residents who have funded the activities of the Alliance to Protect Nantucket Sound, a nonprofit organization that was formed in 2001 in response to Cape Wind's proposal to build the wind plant. The Alliance takes a position of support for wind power as an alternative energy source, but not in Nantucket Sound due to potential adverse economic, environmental and public safety impacts. The Cape Wind developers have spent considerable time and funds countering the Alliance opposition.

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).

Anaerobic Digestion

Anaerobic digestion is a biological process that produces gas mainly composed of methane and carbon dioxide (CO_2) in an oxygen-free environment. Methane is the principle constituent in natural gas and can be run through a reciprocating engine, used to fire a boiler or even to operate a vehicle. It can be burned in every way natural gas can be burned. An anaerobic digester is a technology used to speed the anaerobic digestion process and can be used on a large scale for wastewater treatment facilities or on a smaller sale on farms and with other biologic waste-producing businesses. The methane gas created by anaerobic digestion can be used as a fuel for electricity generation, in the same way that landfill gas is used for electricity generation. Anaerobic digestion facilities utilizing poultry litter qualify as Tier 1 facilities for the Maryland Renewable Portfolio Standard (RPS). PPRP has conducted several studies examining the potential for using poultry litter as fuel for electricity generation in the state. Many farmers are also looking at anaerobic digesters as a solution to their odor problem, along with the use of the waste gas for small scale electricity generation.

Landfill Gas

Landfill gas (LFG) is created when organic 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, LFG will release into the atmosphere as a combination of methane and CO_2, with small amounts of non-methane organic components. If the LFG 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 2-6 lists the LFG-to-energy projects that are currently operating in Maryland. Not listed in the table is the Millersville LFG project, which collects the LFG and sells it to Fort Meade.

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 RPS and the Regional Greenhouse Gas Initiative (RGGI), described in Sections 4.1.1 and 4.2.1, respectively. Significant hurdles to pursuing biomass cofiring are the availability, handling, and preparation of biomass fuels.

Table 2-6 Landfill Gas Projects in Maryland

Landfill Name and Location	Total Waste in Place (2006 tons)	Project Status	LFG Energy Project Start Date	LFG Energy Project Type	MW Capacity	Project Developer
Brown Station Rd. (Prince George's County)	8,900,000	Operational	1987	Recip. Engine	2.6	PG County
		Operational	1987	Boiler	Steam	
		Operational	2003	Recip. Engine	3.5	
Sandy Hill (Prince George's County)	5,126,000	Operational	2003	Boiler	Steam	Toro Energy
Eastern/ White Marsh (Baltimore County)	5,000,000	Operational	2006	Recip. Engine	3	Pepco Energy Services
Newland Park (Wicomico County)	2,765,000	Operational	2007	Recip. Engine	2.6	INGENCO
Central Landfill (Worcester County)	1,700,000	Operational	2008	Recip. Engine	2.0	Curtis Engine
Gude (Montgomery County)	4,800,000	Shutdown	1985	Recip. Engine	2.0	Covanta
		Operational	2009	Recip. Engine	0.8	SCS Engineers
The Oaks (Montgomery County)	6,874,000	Operational	2009	Recip. Engine	2.4	SCS Engineers
Quarantine Rd. (Baltimore County)	8,468,000	Operational	2009	Cogeneration	4.2	Ameresco Federal Solutions
Reichs Ford Landfill (Frederick County)	4,083,000	Construction	2010	Recip. Engine	2	DCO Energy

Notes: The U.S. EPA Landfill Methane Outreach Program defines a candidate landfill as one that is accepting waste or has been closed for five years or less, has at least one million tons of waste in place, and does not have an operational or under construction project; or is designated based on actual interest or planning.

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 capacity rating for single fuel/LFG mode landfill gas and not the maximum capacity rating of 6 MW which includes use of diesel fuel.

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

Most recently Easton Utilities (EU), a municipally owned utility based in Easton, Maryland, has proposed to conduct test burns of domestically produced B20 biodiesel blends at its EU Plant 1, which consists of 10 diesel generators with a combined capacity of 31.9 MW. The generators currently all burn No. 2 fuel oil; however, four are duel-fired with natural gas. EU is considering the use of biodiesel to fulfill its REC requirements under the Maryland RPS requirement. To accomplish this, EU successfully applied for and was awarded a grant in June 2008 by the MEA to cover the costs associated with the design and implementation of the project. The test burns, which will be conducted on Units 13 and 14, are required to be completed by August 1, 2010.

Solar

Currently, there are two primary solar generating technologies — photovoltaic (PV) and concentrated solar power (CSP). Solar PV panels contain rows of solar cells (semiconductor devices usually made of crystalline silicon) electrically connected together and encapsulated in a weatherproof packaging. Multiple solar panels connected together are referred to as an “array”. A solar PV system consists of the solar panels, a mounting system (roof or ground), and an inverter to convert the direct current (DC) electrical current to alternating current (AC) for household or commercial consumption. Concentrating solar power comes in two forms. Concentrating photovoltaics uses mirrors to focus direct sunlight onto photovoltaic cells or panels to create electricity, and concentrating solar thermal uses direct sunlight and mirrors to provide high temperature heat to generate steam that can than be used in a conventional power plant.

The McCormick PV Facility

In January 2009, one of Maryland's biggest solar power installation projects was completed by McCormick and Company, Inc., an American food company specializing in spices and seasonings. The project, carried out by Constellation Energy's Projects & Services Group, provides the clean energy to McCormick's Hunt Valley Distribution Center and their neighboring Spice Mill, which happens to be McCormick's chief milling and grinding facility. The solar energy produced is actually owned by Constellation Energy's Project & Services Group, and purchased by McCormick and Company in a twenty year power purchase agreement.

The end result, consisting of 2,100 Solar World 175 watt crystalline solar panels and a staggering 92,000 square feet of thin-film photovoltaic material, is projected to generate around one megawatt per year, and decrease McCormick's electricity costs by roughly 30 percent for the two facilities in the first year of operation.

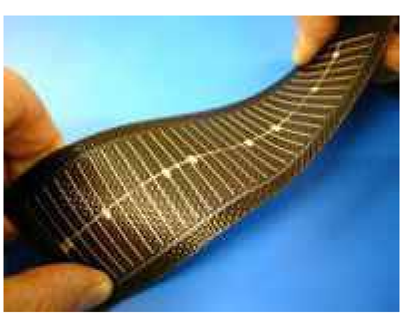
Maryland has a marginal solar resource with respect to developing large, utility-scale PV and CSP installations, as is illustrated in Figures 2-8a and 2-8b. However, Maryland has several policies in place that encourage the deployment of smaller scale (distributed) solar systems. The first is the State's RPS which calls for 20 percent renewable energy by 2022, including two percent that must come from solar energy sources. Additional policy mechanisms include State tax credits, grants, loans, and rebate programs, along with net metering and interconnection standards (discussed in greater detail in Section 4.1) that help facilitate connecting solar energy systems to the transmission grid (see Table 2-7).

Table 2-7 Maryland Incentives for Solar Energy Development

MEA Solar Energy Grant Program		Provides grants for Solar Energy Systems: $1.25/watt for first 4,000 watts $1.00/watt for next 4,001 to 8,000 watts $0.50/watt for next 8,001 to 10,000 watts Maximum grant for a PV system is $10,000
Clean Energy Production Tax Credit		Tax credit of 85 cents/kWh for first five years
County Property Tax Credits	**Anne Arundel**	50% of installed system cost to a maximum of $2,500
	Harford	100% of real property tax to a maximum of $2,500
	Howard	50% of installed system cost to a maximum of $5,000
	Montgomery	50% of installed system cost to a maximum of $5,000
State Sales Tax Credit		100% exemption on solar energy equipment

The most prominent example of a state with average solar resources that has been successful in creating a robust solar market is New Jersey. Similar to Maryland, New Jersey also provides strong policy support of solar technologies. That state's 20 percent RPS requirement features a 2.12 percent solar PV set-aside. Currently, New Jersey has over 3,100 solar PV systems installed throughout the state, second only to California. New Jersey set a national standard with its net metering policy, upon which many other states are modeling theirs. The net metering policy allows for PV systems to connect directly to the distribution system and compensates system owners for the generation of clean, emission-free electricity that is fed back into the grid. The Maryland RPS has begun to stimulate some activity in this sector in Maryland. As of March 1, 2009, there were 94 Maryland Solar Renewable Energy facilities registered in PJM's Generation Attribute Tracking System (GATS) and a total of 252 Maryland Solar Renewable Energy Credits (RECs) had been issued to date.

Thin Film Solar Technology



Thin film solar cells are fast addressing solar power's biggest roadblock: cost. The thin film cells are constructed from slim layers of a semiconductor material, attached onto a low cost backing, such as glass or stainless steel sheets. Less energy and less material is needed in the process than would be for a typical silicon solar cell, which is encouraging to those looking to make solar power a more cost-effective clean energy resource. They are also an appealing alternative to the cells traditionally used, as their light weight means they have numerous applications – from photovoltaic siding to roof shingles.

The advancements in thin-film solar technology are arriving at a rapid pace, with efficiency beginning to breach the range reached by the silicon-based solar cells. For now, however, the research continues to be ongoing.

Figure 2-8a Quality of the PV Resource

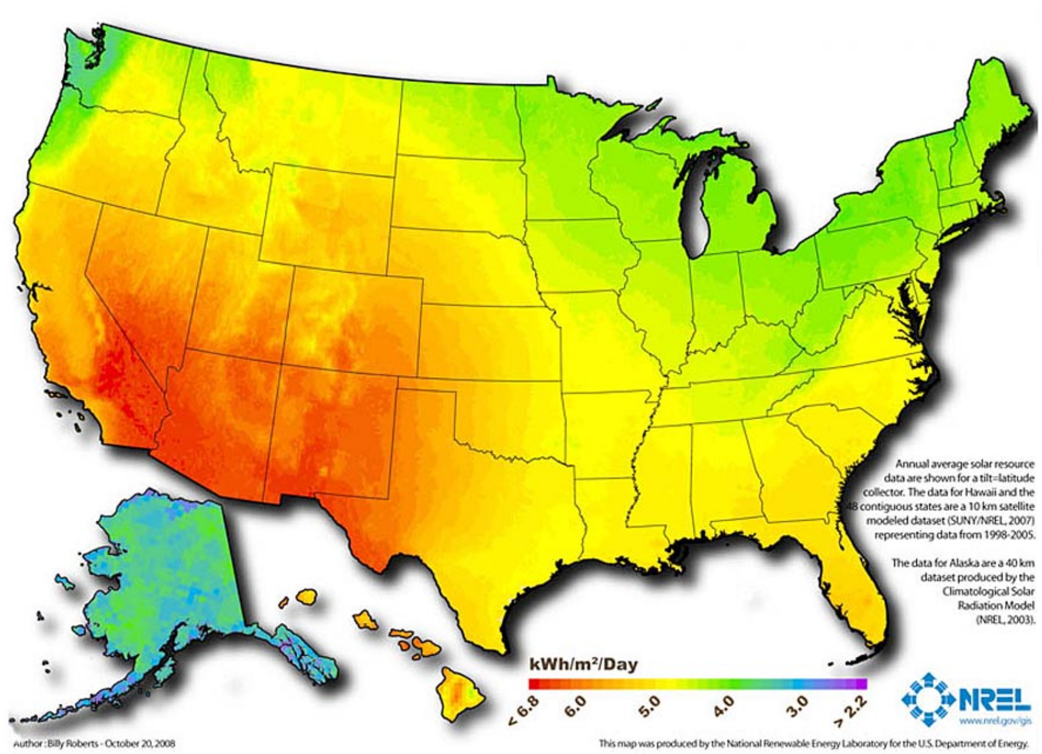
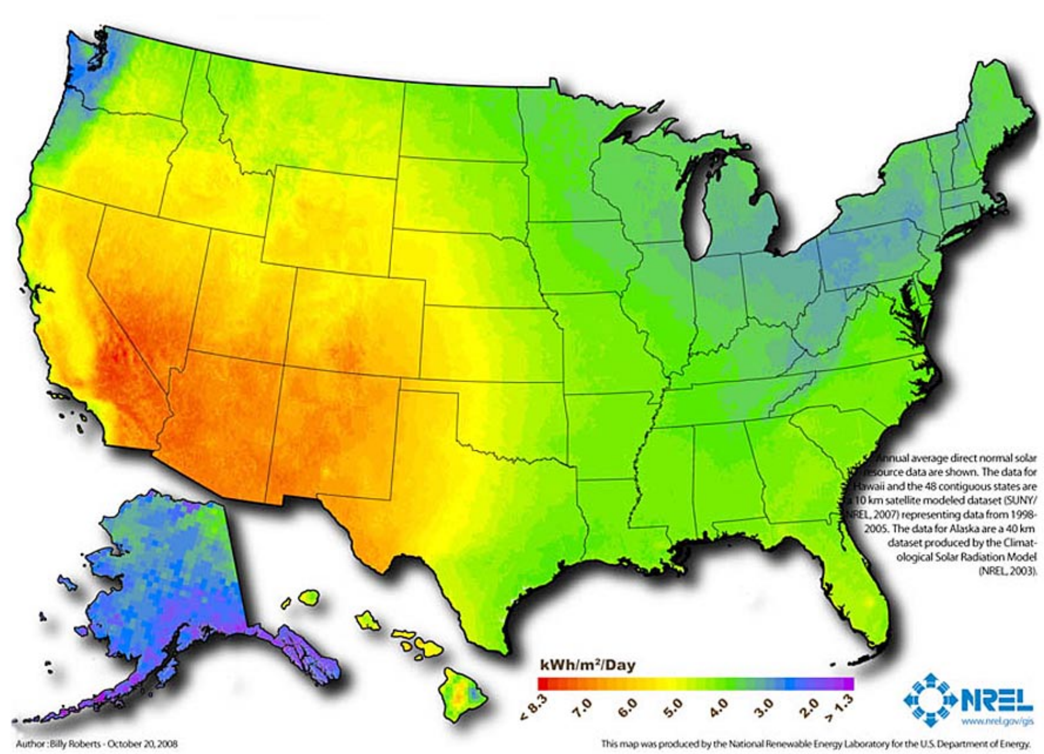


Figure 2-8b Quality of the CSP Resource



Proposed Tidal Power Project on the Indian River Inlet in Delaware

A Maryland firm has proposed tapping energy from the Indian River Inlet's fast tidal currents by fixing a chain of single-file floating turbines to the inlet bottom, with electricity generated on incoming and outgoing tides. The Annapolis-based UEK Corp. wants to install 25 twin turbines with a capacity of about 10 MW. The inlet is fairly deep and nearly 100 yards wide where tides can reach a speed of six knots, making it one of the fastest-running tides on the East Coast. The turbines would be about 45 feet beneath the surface, marked with buoys, and screened to protect fish. The proposed power plant is currently mired in opposition but in August 2008 UEK received a grant from the Delaware Department of Natural Resources Green Energy Office to install a twin turbine at the Indian River Power Plant that will generate electricity from the cooling tower outflow. If testing on the first turbine goes well, the company will add four additional turbines that will be able to generate approximately 442 kWh per year from the tide's kinetic energy.

Hydropower

Hydropower is one of the oldest sources of power, used thousands of years ago to grind grain. The first U.S. hydroelectric power plant began operations in the 1880s. Hydrokinetic energy refers to energy harnessed directly from moving water and includes run-of-river hydro, wave, and tidal energy projects.

A hydroelectric dam is the most well known form of hydropower production, often built on a very large scale by closing off an entire river and forming a large lake-like reservoir. Pumped storage hydro uses off-peak energy to pump water up to an elevated reservoir, which is then used to create electricity during peak hours.

Maryland has two larger-scale hydroelectric dam projects (greater than 10 MW capacity) and seven additional small-scale facilities. Maryland's hydroelectric plants are listed in Table 2-8 with locations shown in Figure 2-9. Chapter 3 includes further discussion about hydroelectricity and its impacts (see page 76).

Wave and tidal power also harness the energy of moving water, specifically in ocean settings. Wave energy facilities float in the water and work off of the up and down motion of the waves. Tidal power is produced by tidal stream generators, which capture the kinetic energy of moving water caused by tidal currents or the fluctuation of the sea level due to the tide. They work much the same way as wind power generators but because water is much denser than air and tides are steady and almost continuous, the generators can produce significantly more power. Maryland has a limited tidal resource as the tides in the Chesapeake Bay tend to be only 2 - 4 feet high and dispersed through a large area. Some potential exists for small-scale projects that may provide localized electricity in the future.

2.2 New and Proposed Power Plant Construction

The PSC has received 23 CPCN applications for new generation over the past eight years, representing several thousand megawatts of potential generating capacity (see Figure 2-10). While the majority of these proposed plants did obtain a CPCN, only 11 are now in operation, with the remainder being delayed or abandoned because of various financial or commercial reasons. Several projects, however, are still considered viable. For example, in 2007 the Kelson Ridge site was purchased by CPV Maryland with plans to develop the site as a new generation facility. The project, a 640 MW natural gas-fired facility, received a CPCN in October 2008.

Figure 2-9 Locations of Hydroelectric Facilities in Maryland

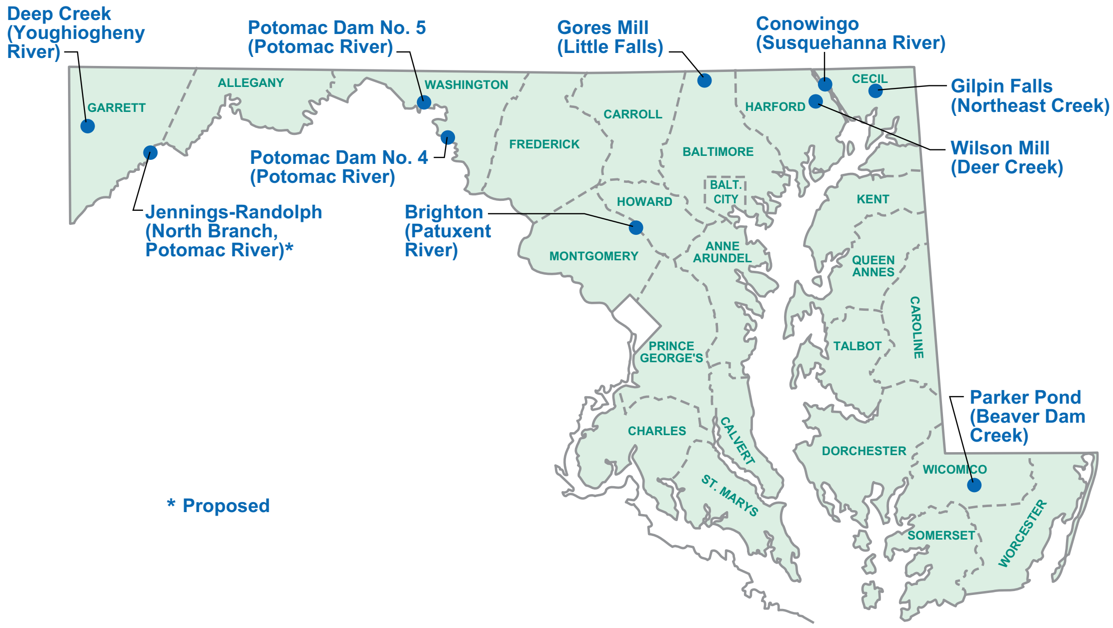


Table 2-8 Hydroelectric Projects in Maryland

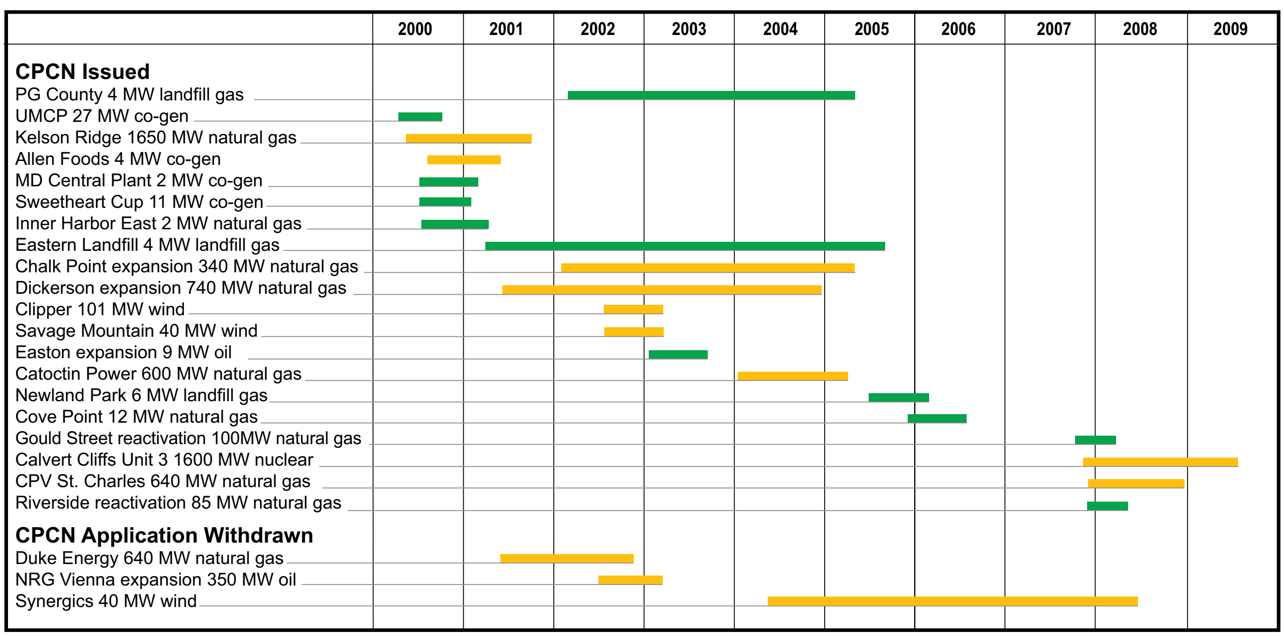
Project Name	Project Capacity	River / Location	FERC Project No.	Owner	FERC License Type	FERC License Issued	FERC License Expires	Year Operational
Large-Scale Projects								
Conowingo	549.5 MW	Susquehanna / Conowingo, Harford County	405	Susquehanna Power Co. and PECO Energy Power Co.	Major License	1980	2014	1928
Deep Creek	20* MW	Deep Creek / Oakland, Garrett County	--	Brookfield Power	None**	--	--	1928
Jennings-Randolph (proposed)	13,400 kW	North Branch Potomac River/ Bloomington, Garrett County	12715	Fairlawn Hydroelectric at COE dam	Preliminary	2007	2011	(proposed)
Small-Scale Projects								
Potomac Dam 4	1,900 kW	Potomac River / Shepherdstown, WV	2516	Allegheny Energy Supply	Major License	2004	2033	1909
Potomac Dam 5	1,210 kW	Potomac River/ Clear Spring, Washington County	2517	Allegheny Energy Supply	Major License	2004	2033	1919
Gores Mill	10 kW	Little Falls / Baltimore County	--	C. Lintz	None	--	--	1950s
Parker Pond	40 kW	Beaver Dam Creek / Wicomico County	--	W.H. Hinman	None	--	--	1950s
Wilson Mill	23 kW	Deer Creek / Darlington, Harford County	--	H. Holloway	None	--	--	1983
Gilpin Falls	396 kW	Northeast Creek / Pleasant Hill, Cecil County	3705	American Hydropower Company	License Exemption	1982	--	1984
Brighton	400 kW	Patuxent River / Clarksville, Montgomery County	3633	Alternative Energy Associated Limited Partnership	Minor License	1984	2024	1986

* 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.

The process by which new power plants were proposed and developed in Maryland has changed as a result of the move to retail competition and electrical utility restructuring. Maryland's regulated utilities are no longer responsible for building new generation. Resource planning resides with the competitive electricity market, driven by economics and price signals. High prices that result from tight supply markets attract investors and developers; low prices that result from over-supplied markets discourage investors from entering the market. This trend produces a situation where many power plants are proposed and built in a short time frame followed by a period where few plants are built. The PJM Interconnection, LLC (PJM) region experienced a boom in power plant development between 1999 and 2003. Figure 2-11 shows the amount of capacity on-line for Maryland, Pennsylvania, and the region. In the late 1990s, with the transition to a restructured market and increased reliance on independent power producers, the amount of new capacity in the region leveled off and then rose more steeply before leveling off again in 2004. In 2002, the wholesale power prices were unusually low, making some projects uneconomic. Projects that had started construction prior to the decrease in wholesale market prices went on-line by 2004, after which there was a slowdown in new facilities coming on-line in the region. With the majority of new facilities being developed to the west of the major load centers of Washington, Baltimore, Philadelphia, and New York, it has become increasingly difficult and expensive to transport electricity over congested transmission lines. Wholesale power prices have been increasing steadily in the last several years, doubling between 2002 and 2008. Additionally, the introduction of PJM's new capacity market has caused capacity prices to change from a low of $5.73/MW-day in 2006 to $153.35/MW-day for 2009. It is envisioned that the increase in prices will ultimately lead to more capacity being built in Maryland.

Figure 2-10 CPCN Requests 2000 - 2008



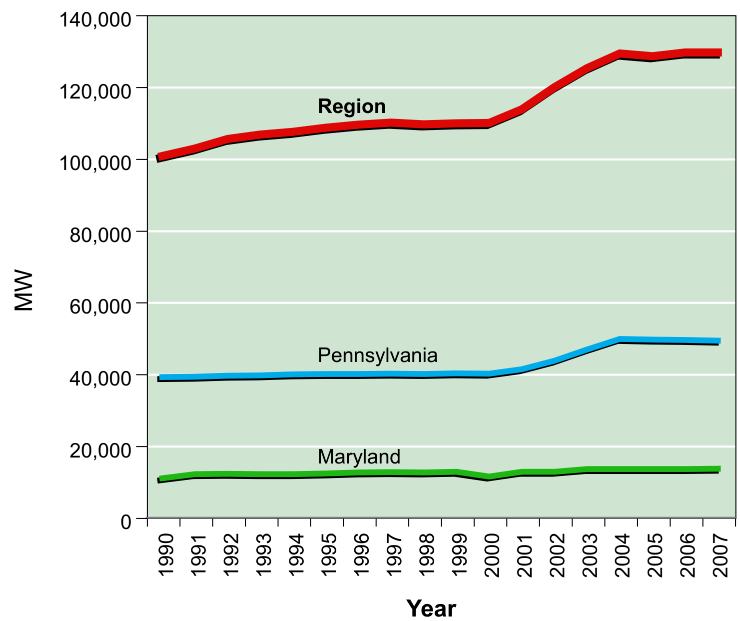
Bar length indicates the duration of the CPCN process from the time the application was filed to the time it was withdrawn or a PSC order was filed. Bar coloring indicates whether the project is now in operation:
= Project is operational
= Project is not operational

2.2.1 Calvert Cliffs Expansion

Construction of new nuclear power plants in the U.S. has been stagnant since the Three Mile Island accident in 1979 – but that appears to be changing. Higher wholesale market prices combined with improvements in nuclear plant design and increasing concern over greenhouse gases are leading investors and power companies to consider building new nuclear facilities. Furthermore, as part of the Energy Policy Act of 2005, Congress provided $3.1 billion in tax credits for new nuclear facilities, along with liability protection and compensation for legislative delays.

In 2007, Constellation and EDF launched the joint venture UniStar Nuclear with the intent to develop new nuclear facilities in the U.S. and Canada. Along with partners AREVA and Bechtel, UniStar is pursuing plans for Calvert Cliffs Unit 3, a new 1,600 MW nuclear reactor just south of the two existing units that Constellation operates at Calvert Cliffs. The new AREVA reactor would be one of the largest in the world, and its addition to the existing Calvert Cliffs site would nearly double the site generating capacity.

Figure 2-11 Regional Installed Capacity



Note: Regional states include Maryland, Delaware, New Jersey, Pennsylvania, Virginia, West Virginia, and the District of Columbia.

The proposal of a new nuclear facility in Maryland brings with it siting, environmental, health, and community issues that need to be addressed as part of the licensing processes overseen both at the federal level by the NRC and the Army Corps of Engineers, and at the state level as part of the CPCN proceedings before the Maryland Public Service Commission (PSC). UniStar applied for a CPCN in November 2007, and the PSC docketed Case No. 9127 to examine the application. As with any proposed power plant, PPRP was responsible for providing a consolidated set of recommendations to the PSC based on a comprehensive review of issues to protect the interests of the State. PPRP conducted an extensive environmental review of the proposed project including an assessment of:

- *Air quality impacts;*
- *Water supply and ground water quality impacts;*
- *Ecological issues, including impacts to threatened and end angered species; and*
- *Socioeconomic, aesthetic, and cultural resource impacts.*

These studies allowed the State Agencies to conclude that the new facility can be constructed and operated in such a way that will not cause any unacceptable environmental or socioeconomic impacts, and therefore, recommended that the PSC grant the CPCN, provided a number of environmental and socioeconomic conditions are met. The PSC issued a final order granting the CPCN, subject to conditions, in June 2009.

Federal licensing of a new nuclear facility will address site suitability, technology selection and safety, environmental impacts, and waste disposal. The State has an opportunity to comment on the federal licensing process as a participant in the case. UniStar submitted its first partial Combined Operating License (COL) application to the NRC in July 2007 with the remaining portions submitted in March 2008. In June 2008, the filing was accepted as complete by the NRC, and the agency began its detailed review. The NRC also initiated work on its Environmental Impact Statement (EIS) as required under the National Environmental Policy Act. The NRC plans to issue a draft EIS in early 2010 for public review and comment.

2.3 Electricity Distribution

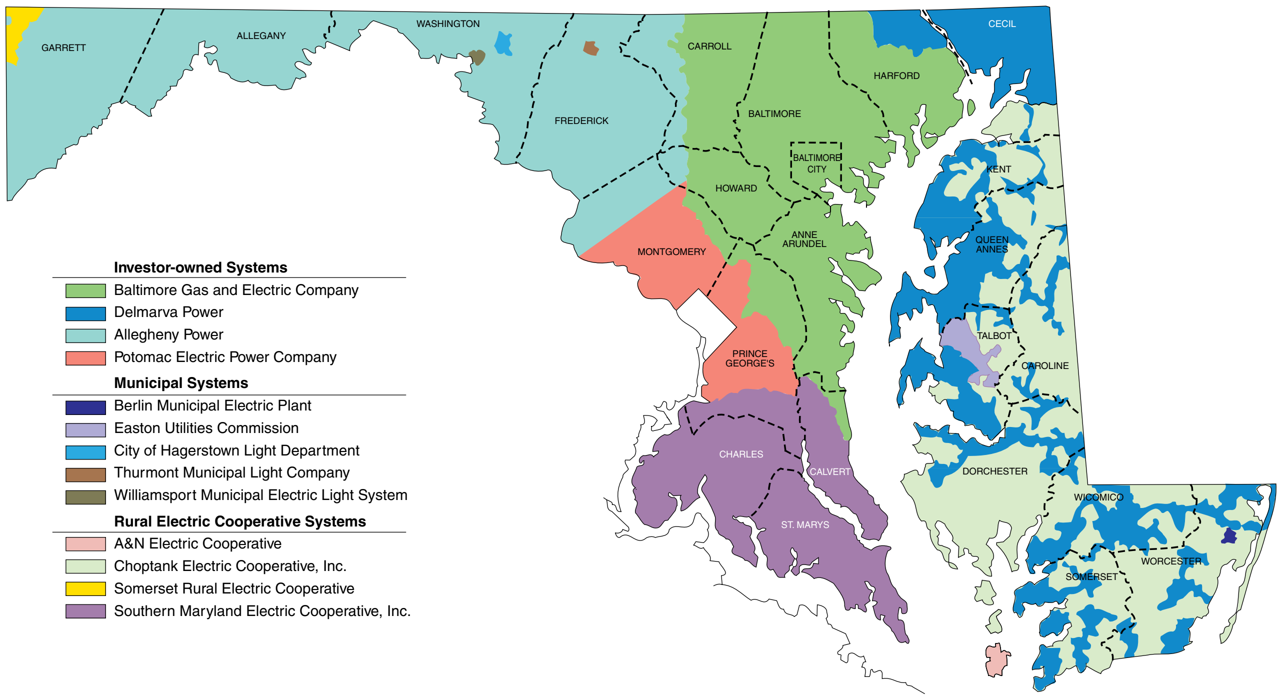
There are 13 utilities distributing electricity to customers in Maryland (see Table 2-9). Four of these are large investor-owned electric companies organized as for-profit, tax-paying businesses: Allegheny Power; Baltimore Gas and Electric (BGE); Delmarva Power; and Potomac Electric Power Company (Pepco). They are owned by three holding companies — Allegheny Energy; Constellation Energy; and Pepco Holdings, which owns both Delmarva and Pepco. Maryland's investor-owned utilities serve approximately 90 percent of the customers in the state. Five utilities are owned and operated by municipalities providing local distribution to a specific area. Four utilities are electric cooperatives, serving generally less populated rural areas. The service territories for the state's distribution companies are illustrated in Figure 2-12.

Table 2-9 Maryland Electric Distribution Companies

Company	Number of Maryland Customers
INVESTOR OWNED	
Allegheny Power	252,432
Baltimore Gas and Electric	1,233,062
Delmarva Power & Light	203,082
Potomac Electric Power Co.	518,248
Subtotal	2,219,599
MUNICIPAL SYSTEMS	
Town of Berlin	2,352
City of Hagerstown	17,645
Easton Utilities Comm.	10,336
Thurmont Municipal Light Co.	2,865
Town of Williamsport	1,012
Subtotal	34,210
COOPERATIVES	
A & N Electric Coop	389
Choptank Electric Coop, Inc.	51,641
SMECO	144,727
Somerset Rural Electric Cooperative	793
Subtotal	197,550
TOTAL CUSTOMERS	2,451,359

Sources: Maryland Public Service Commission Electric Choice Enrollment Report and Energy Information Administration, EIA861 Database, 2005

Figure 2-12 Electricity Distribution Service Areas



2.4 Electricity Markets and Retail Competition

Effective July 2000, the Maryland Electric Customer Choice and Competition Act of 1999 restructured the electric utility industry to allow Maryland businesses and residents to shop for power from various suppliers. Retail customers can now purchase generation from competitive retail electric suppliers. Transmission and distribution services continue to be regulated by federal and state government entities. This section describes the major elements of the electricity markets and the factors influencing retail prices paid by end-use consumers; a more detailed discussion of the markets is included in Appendix B.

2.4.1 Wholesale Markets and PJM

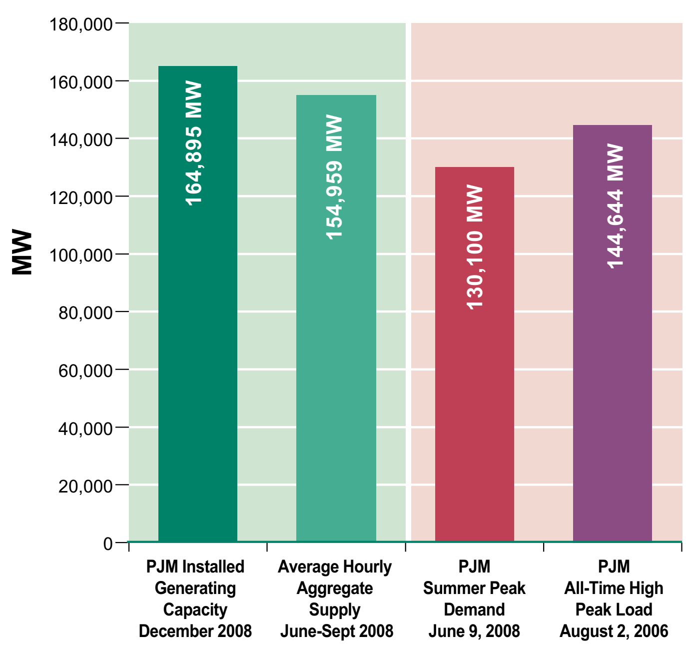
In states with restructured markets, such as Maryland, electricity is generated by a power company that is separate from the entity responsible for transporting and delivering power to end-use customers. Once the necessary permits and approvals are obtained, any entity can generate power, connect to the power grid, and either enter into bilateral contracts or participate in the PJM-administered markets for energy capacity and ancillary services. Entities selling energy on the wholesale market include competitive suppliers and power marketers that are affiliated with utility holding companies, independent power producers not affiliated with a utility, as well as traditional vertically integrated utilities located within the region that might sell any excess generation. Entities that purchase energy in the wholesale market to supply to end-use consumers are referred to as load serving entities (LSEs) and can be either distribution utilities or independent energy suppliers. Like many other commodities, electricity is frequently bought and re-sold several times before finally being consumed. These sales and re-sale transactions make up the wholesale market.

PJM operates and monitors markets for the purchase and sale of both energy and capacity.

- *Energy refers to the electric power transported through transmission and distribution systems that is used by customers for light, heat, electronics, motors, or any number of applications over a given period of time. Energy costs typically include fuel and operational expenses.*
- *Capacity refers to the infrastructure and physical plant available to produce electrical power at any one point in time. Costs for capacity typically include fixed and capital related costs.*

A reliable supply of energy depends upon sufficient electric generating capacity at times of high demand. States that have restructured their retail electricity markets rely on a combination of energy markets and capacity markets to create sufficient economic incentives for development of new generation capacity as that capacity is needed to serve the load. Figure 2-13 shows the 2008 supply and demand in PJM.

Figure 2-13 PJM Supply and Demand for 2008



PJM uses a uniform price auction based upon locational marginal prices (LMPs), which vary across PJM zones and according to time of day, to establish regional energy and capacity prices (see Appendix B for additional information). Electricity generators bid in the amount of energy or capacity they would like to sell at a particular time and price.

Energy

For energy products, the PJM operator determines the hourly dispatch of plants on the basis of price bids submitted by suppliers. Zone-wide energy prices are based upon the bids designating a price and quantity at which a generator is willing to sell electricity. PJM stacks these bids from lowest price to highest price until it is able to satisfy the quantity required to meet demand in the zone. It is the price of the last resource, the marginal price, that becomes the zone-wide energy component of the hourly LMP for the next operating day. Day ahead and real time LMPs for 2008 are shown in Table 2-10.

Table 2-10 PJM Off-Peak and On-Peak Hourly Locational Marginal Prices for 2008

	Day Ahead		Real Time	
	Off Peak ($/MW)	On Peak ($/MW)	Off Peak ($/MW)	On Peak ($/MW)
Average	$53.11	$81.00	$53.76	$80.87
Median	$46.92	$73.92	$43.38	$70.81

Note: According to PJM's independent market monitor, average LMPs have come down considerably in 2009, though part of this can be attributed to general reductions in electricity demand and fuel prices. After adjusting for fuel costs and load, an overall reduction of 11 percent in LMP has been realized for the first nine months of 2009.

Source: Monitoring Analytics, "2008 State of the Market Report for PJM," March 11, 2009.

Congestion Costs

PJM must also account for congestion costs. Congestion occurs between two delivery points on the transmission system when the transmission grid cannot accommodate the power flows between these locations. During periods of congestion to accommodate the power supply requirements for the sink location, i.e., where the energy will be consumed, PJM must dispatch relatively uneconomic generation resources that are located at or near the load zone and that do not rely on the congested portion of the transmission grid. The cost of congestion refers to the incremental cost of dispatching these uneconomic resources.

Congestion most often occurs during times of peak demand, when transmission lines are reaching full capacity and certain sections become constrained, either due to physical, electrical, or operational limits. LMP differentials between PJM regions (see Table 2-11) have been mainly due to congestion between the western region, where abundant low-cost generation is located, and the mid-Atlantic region, where the large load centers are located. PJM estimates that congestion added approximately $72.2 million in costs for BGE in 2008 and $96.5 million in the Delmarva Power & Light zone. Congestion and its relationship to electric system reliability are discussed in more detail in Section 2.6.3.

Table 2-11 Average Annual LMP for 2008

Maryland	$79.75	Pennsylvania	$68.98
Washington, D.C.	$80.57	West Virginia	$55.02
Delaware	$76.26	Ohio	$52.64

Source: 2008 State of the Market Report, PJM MMU, March 2009

Capacity

Prior to electricity restructuring, Maryland, like most other states, would identify a need for generating capacity as part of the Integrated Resource Planning (IRP) process. Capacity was constructed, typically by vertically integrated utilities, once a need was identified and a permit to construct was issued by the PSC. The cost of building and operating the new generation capacity was included in customer rates, which were regulated by the PSC. With the movement toward electric industry restructuring, the generation function was placed in the competitive arena and the competitive market is relied upon to provide new generation sources to meet load requirements. The capacity market was established by PJM to provide a mechanism to give incentives to power plant owners and developers to keep existing plants on-line and to construct new generating capacity as market conditions dictated.

PJM initiated its first capacity market, the Capacity Credit Market, in late 1998. During the first few years, the PJM region experienced a boom in new plant construction, followed by a drop in capacity prices (from $18,124/MW-year in 1999 to $2,089/MW-year in 2005). With the drop in capacity prices came a decline in the development of new generation resources. In 2007, PJM modified the capacity market creating a new forward capacity market based on the PJM Reliability Pricing Model (RPM), a model of the expected supply and demand of capacity within PJM which requires LSEs to purchase or own capacity resources three years ahead of the implementation year. The RPM capacity market also provides LMPs (see Appendix B for details).

Prior to the development of RPM, capacity resource purchases and settlements were typically short-term transactions completed as needed during periods of high demand. This would produce volatile price signals, with capacity prices often dropping to near zero when real-time demand was low. The risk of uncertain revenue streams increased financing costs, making it increasingly difficult to attract investors to the PJM region. PJM anticipated that by creating a longer-term (three-year) price signal for capacity resources, projects would have stable revenues in the early years, thereby lowering project finance risks and attracting new investors.

The RPM forward capacity market is designed so that the responsibility for guaranteeing sufficient capacity resources rests with LSEs. LSEs are required to satisfy a capacity obligation based on an average of their loads occurring coincident with the five highest annual PJM peaks, plus an additional reserve margin of approximately 15 percent. LSEs may supply their own capacity resources by entering into bilateral contracts for capacity and providing PJM with a plan that demonstrates their ability to satisfy their individual reliability obligations. Those LSEs that do not have sufficient capacity resources to cover their capacity obligations participate in the RPM capacity auction to contract for the necessary resources.

The RPM capacity market auction is a three-year forward annual auction, meaning that the auction for a given delivery year is held three years in advance of the delivery period. Capacity resources that participate in the auction are required to commit their resources for a full year. Incremental auctions are held in the following two years to make adjustments or fill gaps in capacity requirements. In the case of the 2012 delivery year, for example, the base auction was held in May 2009, with incremental auctions to be held in May 2010 and 2011.

The RPM is based on a derived demand curve that incorporates the cost of new entry (CONE), based on the cost of building a standard combustion turbine (CT) natural gas power plant. The supply curve arises from the generator bids into the RPM auctions. The value of CONE is a significant determinant of the demand curve so that, in conjunction with the results of the Base RPM auctions, one can derive a market clearing price for capacity up to three years in advance of in-service dates.

Results of the RPM auctions are provided in Table 2-12. The capacity prices set by the auction process were significantly higher for the eastern area of PJM, where Maryland's distribution utilities operate, compared to the remainder of PJM, primarily due to transmission constraints. However, prices have converged further out for the 2010 to 2012 timeframe, perhaps in anticipation of the new backbone transmission lines that are projected to be in service then (transmission and reliability are discussed later in this chapter).

Table 2-12 RPM Base Auction Results

Delivery Year	Rest of PJM	BGE & Pepco	Delmarva
June 2007 – May 2008	$40.80/MW-day	$188.54/MW-day	$197.67/MW-day
June 2008 – May 2009	$111.92	$210.11	$148.80
June 2009 – May 2010	$102.04	$237.33	$191.32
June 2010 – May 2011	$174.29	$174.29	$174.29
June 2011 – May 2012	$110.00	$110.00	$110.00
June 2012 – May 2013	$16.46	$133.37	$222.30

2.4.2 Retail Markets and Competition

The fundamental objective of the 1999 Maryland Electric Customer Choice and Competition Act (the Act) was to foster retail electric competition as a means of achieving favorable retail prices, providing an array of alternative supply products (for example, green power supply), and giving customers a choice in their electric power supplier. However, the competitive market has not developed as hoped when the legislation was adopted. Implementation of the Act included the capping of residential and small commercial customer rates for the state's investor-owned utilities. The caps kept rates at or even below the rates that competitive suppliers were able to offer, creating little incentive for suppliers to enter the market or for customers to choose alternative suppliers.

Immediately after implementation, some competition occurred in the Pepco region due to aggressive marketing by suppliers in this area. By the summer of 2003, competitive suppliers had enrolled more than 70,000 residential and 10,000 commercial and industrial customers in this region, corresponding to 16 percent of total customer accounts and 28 percent of the total load obligation in the region. Shortly after the summer ended however, most competitive suppliers left the residential supply market because of the low level of customer interest, and by the summer of 2005, the number of Maryland residential customers served by competitive suppliers had fallen to less than 30,000 (primarily still Pepco customers). Despite the expiration of rate caps (see schedule in Figure 2-14) and a sharp jump in retail electricity prices facing residential customers, only 2.8 percent of residential customers have selected an alternative supplier (see Table 2-13). Even at its height in 2003, residential customer choice never surpassed 3.9 percent. However, enrollment by commercial and industrial customers has increased since 2006, when large commercial and industrial customers were first exposed to hourly market rates under the utilities' default service offerings.

Figure 2-14 Maryland Rate Freeze Timelines

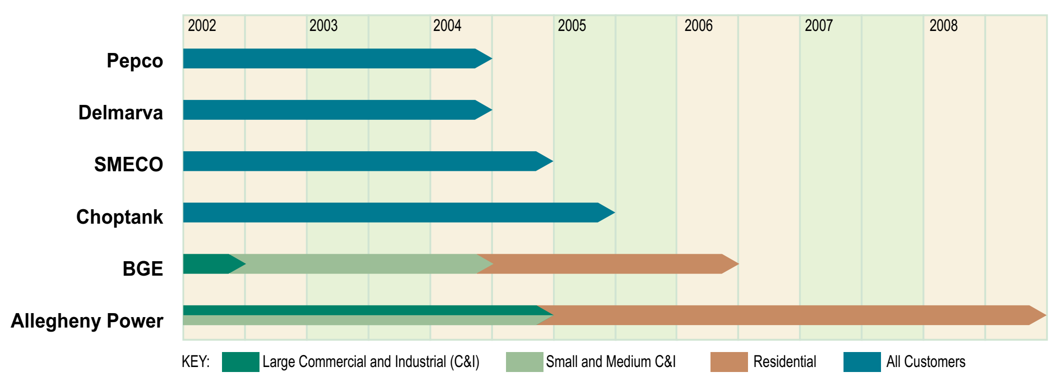


Table 2-13 Percentage of Customers Served by Competitive Suppliers

Residential	Small C & I	Mid C & I	Large C & I
2.8%	17.0%	47.3%	86.7%

Source: Maryland PSC, Electric Choice Enrollment – January 2009.

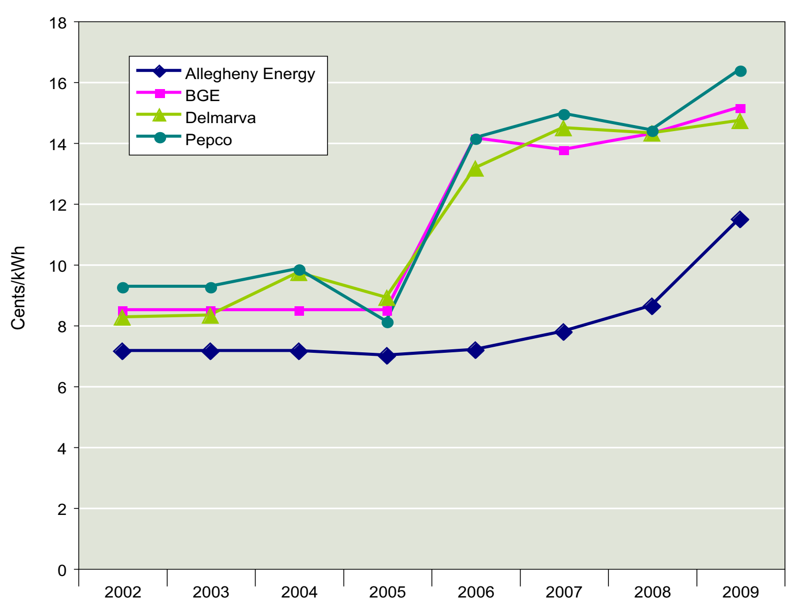
2.4.3 Standard Offer Service

Residential and small commercial customers that do not choose to transact with a competitive supplier are provided with electricity service from their local utility at rates approved by the PSC. This utility-supplied service is referred to as Standard Offer Service (SOS). Table 2-14 lists retail suppliers' residential rate offers compared to the default SOS rates offered by the regulated utilities for the summer of 2009. As of June 2009, there were no suppliers offering residential electricity service in the Southern Maryland Electric Cooperative (SMECO), or Choptank Electric Cooperative service areas. Allegheny Power has just one competitive supplier offering residential retail electricity services, as Allegheny Power's residential rate cap expired on December 31, 2008.

As the rate caps expired, it became necessary to establish a new method of electricity supply for "non-shopping" customers. The PSC presided over an extensive stakeholder process resulting in a competitive procurement framework through which each utility was required to procure one- to three-year power supply contracts to meet the needs of residential SOS customers. Other PSC proceedings determined the framework through which utilities would procure SOS electricity supply resources for non-shopping intermediate commercial customers (those with peak demands of 60 kW to 600 kW), and extended the availability of SOS through at least May 2009.

Rate freezes have now expired for all residential customers, and with the price caps removed, customers now receive electricity at a price that is set by the wholesale market. Wholesale market prices have risen significantly since 2000, and residential customers have seen substantial increases in their electric bills since the removal of the price caps. Figure 2-15 compares the residential SOS rates in effect in 2002 and for each subsequent year.

Figure 2-15 Comparison of Summer Retail Electricity Rates for Residential SOS Customers, 2002 - 2007 (cents/kWh)



Despite recent decreases in forward electricity prices, recent solicitations for SOS issued by Maryland's investor owned utilities were unable to secure contracts with "reasonable" prices. For purposes of the utilities' procurement processes, the reasonableness of a bidder's price is determined by the Price Anomaly Threshold (PAT). The PAT is a formula comprised of historical average data, forward electricity price quotes, and other cost factors that determine a range of costs that is reasonable and acceptable given current market data. The PAT is designed to shield against the possibility that, for example, a scarcity of bidders could keep the auction from being competitive and could lead to companies winning electricity supply contracts at prices substantially above market.

In the fall of 2008, the bids in response to the SOS auctions for service to residential and small commercial customers of BGE, Pepco, Delmarva Power, and Allegheny Power were mostly disallowed due to their exceeding the PAT. Following the third procurement effort to obtain acceptable bids and award contracts for the unserved load, held January 12th, 2009, the Commission issued Order 82418 in Case 9064 directing the utilities, specifically BGE and Delmarva, to negotiate bilateral contracts with those qualified bidders whose bids were the lowest and secured at least one of the unfilled blocks bid in the January 12, 2009 solicitation. BGE and Delmarva were able to negotiate the contracts for all blocks of the unserved load with electricity priced at a level that would have been accepted if such price had been bid during the January 2009 solicitation. SOS auctions held in the spring of 2009 provided prices that fell under the PAT and thus were deemed acceptable; however, there were very few participants in the auctions for residential SOS in the BGE and Allegheny Power service areas.

Table 2-14 Residential Supplier Offers as of August 2009

Electric Suppliers	Contract	August '09 Rates (Cents/ kWh)
BGE SERVICE AREA		
BGE / Price to Compare	***N/A***	***0.1197***
Commerce Energy, Inc.	100% Wind (12 mo.)	0.156
	Sure Choice (12 mo.)	0.131
	Sure Choice Plus (24 mo.)	0.135
Clean Currents	50% Wind (12 mo.)	0.113
	50% Wind (24 mo.)	0.113
	100% Wind (12 mo.)	0.118
	100% Wind (24 mo.)	0.118
Horizon Power & Light	Fixed (6 mo.)	0.1066
	Fixed (9 mo.)	0.1085
	Fixed (12 mo.)	0.1106
Washington Gas Energy Services	5% Wind (12 mo.)	0.108
	5% Winds (24 mo.)	0.108
	5% Wind (36 mo.)	0.109
	50% Wind (12 mo.)	0.119
	50% Wind (24 mo.)	0.109
	100% Wind (12 mo.)	0.131
	100% Wind (24 mo.)	0.131
DELMARVA SERVICE AREA		
Delmarva/Price to Compare	***N/A***	***0.1111***
Horizon Power & Light	Fixed (6 mo.)	0.1065
	Fixed (9 mo.)	0.1087
	Fixed 12 mo.)	0.1108
Washington Gas Energy Services	5% Wind (12 mo.)	0.099
	5% Wind (24 mo.)	0.102
	5% Wind (36 mo.)	0.114
	50% Wind (12 mo.)	0.110
	50% Wind (24 mo.)	0.113
	100% Wind (12 mo.)	0.122
	100% Wind (24 mo.)	0.125
PEPCO SERVICE AREA		
Pepco / Price to Compare	***N/A***	***0.1251***
Clean Currents	50% Wind (12 mo.)	0.112
	50% Wind (24 mo.)	0.112
	100% Wind (12 mo.)	0.117
	100% Wind (24 mo.)	0.117
Horizon Power & Light	Fixed (6 mo.)	0.1065
	Fixed (9 mo.)	0.1087
	Fixed (12 mo.)	0.1108
Washington Gas Energy Services	5% Wind (12 mo.)	0.108
	5% Wind (24 mo.)	0.108
	5% Wind (36 mo.)	0.109
	50% Wind (12 mo.)	0.117
	50% Wind (24mo.)	0.117
ALLEGHENY SERVICE AREA		
Allegheny Power/Price to Compare	***N/A***	***0.0971***
Washington Gas Energy Services	5% Wind (12 mo.)	0.081
	5% Wind (24 mo.)	0.081
	5% Wind (36 mo.)	0.086
	50% Wind (12 mo.)	0.092
	50% Wind (24 mo.)	0.092
	100% Wind (12 mo.)	0.105
	100% Wind (24 mo.)	0.105
SMECO SERVICE AREA		
SMECO/Price to Compare	***N/A***	***0.1189***
CHOPTANK SERVICE AREA		
Choptank Power/Price to Compare	***N/A***	***0.0891***

Based on the results of the fall 2008 and spring 2009 SOS auctions, suppliers are either not able or are not willing to provide reasonably priced electricity supply bids for Maryland SOS. This is likely due to a combination of factors influencing electricity markets, listed below.

1. *Conditions in the financial and credit markets add to the risk and price of all contracts. In particular, the cost of collateral, a requirement of participating in the SOS contracts, has increased. Furthermore, for those companies who have received a ratings downgrade the amount of collateral required would also increase.*
2. *A lack of investment in new transmission and generation has led to increased capacity costs and credit constraints are likely to further delay construction of new facilities.*
3. *There are fewer bidders able to participate in the auctions, both due to some consolidation in the industry and problems with the credit crisis making it more difficult for firms to qualify under the financial criteria applied to all prospective bidders.*

2.5 Reregulation

As envisioned, retail competition in the electricity sector would allow consumers to choose a power supplier based on personal preferences for the price and services. Competing retail suppliers were expected to provide new products, risk management, demand management, and services to better match individual consumer preferences. Capped electricity rates at below-market electricity prices hindered residential and small commercial customer switching between 2000 and 2007. However, even as the residential rate caps expired, switching rates remained very low and in early 2009, over 97 percent of residential customers continue to receive utility-provided SOS.

With electric industry restructuring, it was anticipated that market prices would provide signals to power plant developers and new power plant construction would result as market prices for electricity increased. Since the late 1990s, however, very little new generation has been constructed in the mid-Atlantic, and concerns have arisen regarding the reliability of power supply in Maryland and other nearby states. Construction of proposed high-voltage transmission lines would alleviate the potential for power supply shortages in the mid-Atlantic for the near term, but ultimately new power plants will need to be constructed near the load centers in the mid-Atlantic area as excess generation capacity in the Western portion of PJM is absorbed.

The state of the Maryland electricity markets and retail competition has been under review by the PSC since the enactment of Senate Bill 1 in 2006.[2] Lawmakers enacted legislation that incrementally re-regulates portions of the electricity sector in 2006 and 2007 (see Table 2-15). The matter was considered again during the legislative session in 2009, and is likely to be considered once again in legislation during the 2010 Session of the Maryland General Assembly.

Arguments for Reregulation of Power Plant Development in Maryland

For:

- *Provides greater control to State for ordering the construction of power plants based on projected electricity needs.*
- *Would allow the State the opportunity to select specific technologies and energy resources for production of electricity.*

Against:

- *Reintroduces the risk of overbuilding power plant capacity by creating incentives for capital expansion, which was one of the underlying reasons for deregulation following the construction of expensive qualifying facilities and nuclear power plants in the 1970s.*

Senate Bill 400, *Electric Industry Restructuring - Proceedings - Review and Evaluation,* introduced and passed during the 2007 legislative session, directs the PSC to study and report on whether and how Maryland might "re-restructure" its electricity markets. To this end, the PSC conducted several proceedings and issued a series of reports. Specifically, the PSC modeled the potential economic cost or benefit to ratepayers if the fleet of Maryland electricity plants now owned by Mirant Corporation were returned to rate base regulation to serve the Pepco load.[3] After considering the issues, the PSC concluded in the Final Report, *Options for Re-regulation and New Generation,* that the costs and risks of implementing "full re-regulation" left it unable to recommend that the General Assembly pursue legislation in that regard, despite the potential benefits.

A supplemental report, *Financial Risk Analysis of the Return to Rate Base Regulation,* prepared at the request of the General Assembly, reiterates its recommendation that the "General Assembly focus on prospective options for incremental, ratepayer-focused 're-regulation' and, in any such legislation, allow the Commission to retain the authority and flexibility to respond to evolving economic conditions and ensure that new generation serves ratepayers' interests." It is expected that legislative consideration of these issues will continue with the upcoming 2010 legislative session.

[2] Senate Bill 1 Public Service Commission - Electric Industry Restructuring of the Special Legislative Session in 2006 provides the PSC with the authority to require the development of new generation resources.

[3] The economic analysis addressed reregulation options only in Pepco's Maryland service area. The BGE service area was excluded due to then-ongoing merger discussions between MidAmerican Energy Holding Company and Constellation Energy Group, parent of BGE.

Table 2-15 Legislative Initiatives Addressing the Reregulation of the Electric Industry

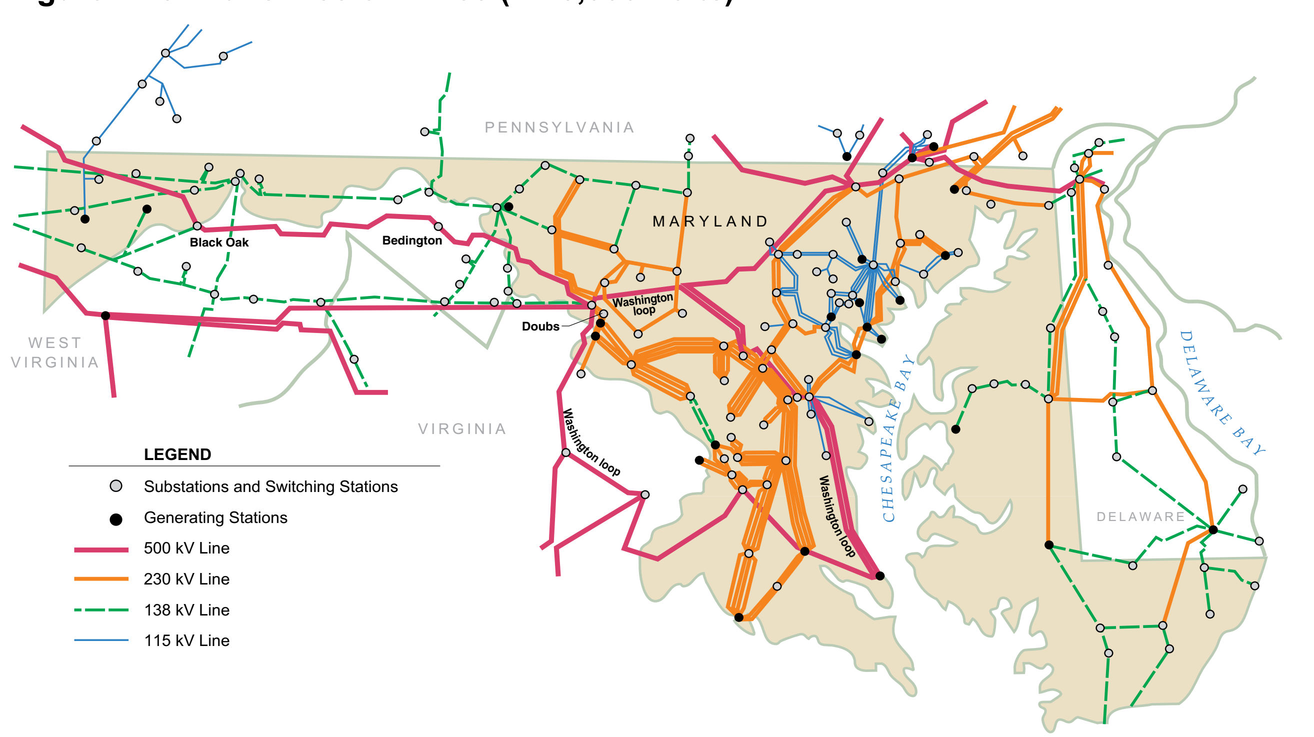
Bill Number and Year	Title	Synopsis
SB 1, Special Session, 2006	Public Service Commission - Electric Industry Restructuring	Authorizes the PSC to require or allow the construction of new generation facilities by investor-owned utilities. Modifies provisions relating to SOS, including changing the electricity supply bid process and creating a framework for rate increase stabilization plans.
SB 400 - 2007	Electric Industry Restructuring - Proceedings - Review and Evaluation	Directs the PSC to study and report on whether and how Maryland might "re-restructure" its electricity markets including recommendations for statutory and regulatory changes to increase the availability of generation and transmission assets in the state. • Conduct hearings and utilize outside experts to study and evaluate the status of electric restructuring in the state • Consider changes that provide a reliable electric system at the best possible price • Study and report on whether and how Maryland might "re-restructure" its electricity markets • Consider the implications of requiring or allowing IOUs to purchase electricity by competitive negotiated contracts; and construct, acquire, or lease generating plants and associated transmission lines

2.6 Transmission and Reliability

The network of high-voltage lines, transformers, and other equipment that connect power plants to distribution systems are part of an expansive transmission system connecting Maryland with the PJM region. In Maryland there are more than 2,000 miles of transmission lines operating at voltages between 115 kV and 500 kV. Figure 2-16 shows a map of this high-voltage transmission grid in Maryland.

Historically, the transmission system enabled utilities to locate power plants near inexpensive sources of fuel, and transmit electricity over long distances to consumers. By interconnecting transmission systems, utilities were able to improve reliability by backing up each other's generation capacity. The power grid that began as a local structure grew into an interstate system subject to both federal and state regulation. The federal Energy Policy

Figure 2-16 Transmission Lines (>115,000 Volts)



Act of 1992 required that any generator, independent or utility-owned, be given access to the transmission grid at rates and terms comparable to those that the owner-utility would charge itself. This access to the transmission grid led to the growth of wholesale power markets. Power generators were able to use the transmission system to send power to one another as needed to serve the loads of their customers, creating larger, more regional transmission networks. With the creation of regional transmission systems and competitive wholesale markets, utilities were required to transfer the finctional control of their transmission lines to independent system operators (ISOs), such as PJM, while maintaining ownership and maintenance responsibilities over their lines.

2.6.1 Reliability

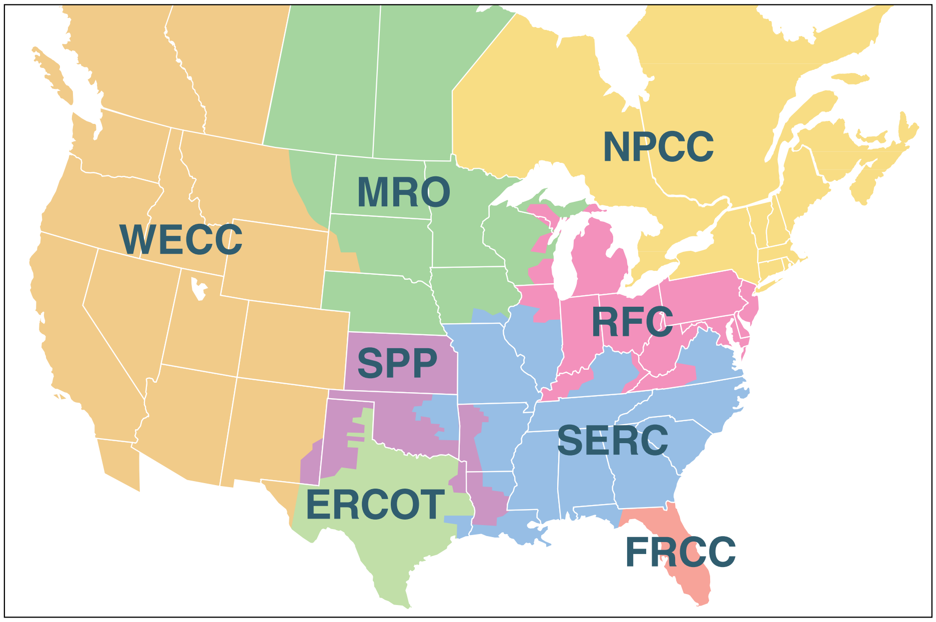
To provide reliable power supplies at reasonable prices, adequate electric infrastructure is required. Recognizing that grid-delivered power must meet specific reliability and quality standards, FERC approved 83 mandatory reliability standards organized under 13 categories in March 2007. Development of mandatory standards was part of the Energy Policy Act of 2005 prompted by the Northeast blackout of August 2003. The North American Electric Reliability Corporation (NERC) is charged with developing guidelines and protocols for implementing the standards and assessing the reliability of the bulk power system. Since March 2007, FERC has approved an additional 11 standards, including eight cyber security standards. Several additional standards are under development or pending approval with FERC. NERC also delegates enforcement authority to eight regional reliability councils, including the Reliability First Corporation that serves the PJM ISO (see map in Figure 2-17).

One of the reliability standards developed and enforced by the Reliability First Corporation is the Resource Planning Reserve Requirement. The standard requires that each LSE participating in the PJM Regional Transmission Organization have sufficient resources such that there is no loss of load from insufficient resources more than once in ten years. In order to maintain compliance under this reliability standard, PJM conducts annual resource planning exercises to ensure all LSEs have sufficient generation resources to supply their peak electricity load, plus a specified annual reserve near 15 percent. PJM operates the RPM capacity market to help LSEs obtain sufficient resources to meet their peak electricity load and reserve margin. More information on the PJM capacity market and RPM is found in Appendix B.

2.6.2 PJM Transmission Planning

PJM conducts reliability studies in order to forecast potential problems and to plan for the expansion and upgrade of the transmission system to mitigate or alleviate problems. PJM's Regional Transmission Expansion Planning (RTEP) Process Reliability Assessment models future load and energy use and highlights likely problems and the effectiveness of proposed grid improvements. As a result, PJM has developed a 15-year Transmission Plan that includes upgrades to help alleviate constraints identified in the modeling. Once a transmission constraint is identified, PJM authorizes construction and cost recovery of upgrades to address the area of concern. PJM mandated upgrades may also require a CPCN depending on state siting and permitting regulations. There are two types of upgrade projects, baseline upgrades and network upgrades. Baseline upgrades include modifications or additions within the existing PJM system to eliminate reliability criteria violations. Network upgrades are new systems or upgrades required to eliminate reliability criteria violations caused by the interconnection of new generation facilities or long-term firm transmission service requests.

Figure 2-17 NERC Reliability Councils



LEGEND

WECC – Western Electric Coordinating Council
MRO – Midwest Reliability Organization
SPP – Southwest Power Pool
ERCOT – Electric Reliability Council of Texas
NPCC – Northwest Power Coordinating Council
RFC – Reliability First Corporation
SERC – SERC Reliability Corporation
FRCC – Florida Reliability Coordinating Council

Source: NERC, 2006 Long-Term Reliability Assessment, October 2006.

On February 27, 2009, PJM released the 2008 RTEP report, which outlines planned system upgrades approved by PJM's Board through December 31, 2008. During 2008, the PJM Board approved 450 additional transmission upgrade projects valued at approximately $3.4 billion. The projects include a reconfiguration of the Mid-Atlantic Power Pathway (MAPP) Project to incorporate the use of a high-voltage direct current line for the portion that crosses the Chesapeake Bay from Calvert Cliffs to Vienna and Indian River (see Section 2.6.4 for additional information). More than $13.2 billion in transmission upgrade projects and additions, ranging in size from 69 kV to 765 kV, have been approved by the PJM Board between 1999 and 2008.

Maryland RTEP Upgrades

The 2008 RTEP identified several transmission upgrade projects that were needed to address reliability issues in Maryland. Two major high-voltage lines (PATH and MAPP, discussed in greater detail later in this chapter) are considered key to resolving projected NERC reliability violations and meet load growth in Maryland and D.C. Additionally, PJM has identified 20 other network upgrades costing more than $5 million each, including transformer replacements, existing line rebuilds and up-rates, and new substation installations.

2.6.3 Congestion

As discussed in Section 2.4.1, congestion describes a situation in which lower cost power cannot reach its intended market because the transmission system does not have enough capacity to carry the electricity. Frequently occurring during periods of peak demand, congestion results from a constraint along the transmission line — either a physical, electrical, or operational limit. When a constraint hampers the delivery of electricity, system

PJM 15-Year Transmission Plan

The PJM Interconnection Board approved its first 15-year regional electric transmission plan on June 23, 2006. The plan authorized construction of $1.3 billion in electric transmission upgrades, including the 240-mile, 500-kilovolt Trans-Allegheny Interstate Line (TRAIL) that will run from southwestern Pennsylvania to Virginia and will be constructed by Allegheny Power and Dominion. PJM directed additional studies and evaluation of 10 significant transmission line proposals totaling $10 billion of potential new investment, including the high-voltage transmission line projects proposed by American Electric Power, Allegheny Power and Pepco Holdings, Inc.

PJM at a Glance, 2008

Key Statistics	PJM Area	State of Maryland
Population	51 million	5.6 million
Transmission lines	56,381	2,200+ miles
Generation units	1,287	176
Installed capacity	165,000+ MW	13,700 MW
Peak demand, August 2006	144,644 MW	14,935 MW

MD population from U.S. Census Bureau for 2008.
MD transmission line mileage from PPRP's transmission line database, DNR GIS Division.

operators may have the option to "redispatch" generation by increasing output from a higher cost generator on the customer's side of the constraint, and reducing generation on the other side to resolve the congestion. However, dispatching higher cost power in place of lower-cost power increases the price of electricity in the constrained zone.

Congestion may also affect reliability when a transmission line nears or exceeds its transfer limit, the physical limit of the transmission system and there are no supplemental generation resources downstream of the constraint. When this occurs, system operators might ask large customers to voluntarily curtail their loads or, in extreme situations, may even be forced to reduce electricity deliveries to consumers. While this type of congestion may result in economic consequences to the consumer, it is not due to higher electricity costs. Economic congestion that results in higher electricity costs is far more common than a loss-of-load, or blackout caused by insufficient transmission or generation resources.

Eliminating key constraints can alleviate congestion. This may be achieved through construction of new transmission lines, building new generation within a load pocket, or demand side management, which are required when congestion causes reliability issues. It is not always cost-effective, however, to make the additional investments that would be required to alleviate economic congestion, which is a business decision rather than a reliability problem.

The cost of economic congestion is estimated by examining the transaction prices that cannot be completed due to a constraint and comparing those to the more expensive value of the generation forced by the constraint. According to PJM, total economic congestion costs for 2008 in the PJM system were $2.117 billion.[4] The AP South and Bedington-Black Oak Interfaces, which are part of the primary PJM west to PJM east transmission transfer facilities accounted for 34 percent of total economic congestion costs in 2008. The Bedington-Black Oak Interface is a significant segment for bringing electricity into the Washington and Baltimore metropolitan area. A rough estimate derived from zonal cost data puts total Maryland economic congestion costs at approximately $480 million per year.

Congestion during periods of peak demand in Maryland produces some of the highest hourly electricity prices in the PJM region. The electricity needs of the Baltimore and Washington metropolitan areas are supplied not only by local generation, but also by high-volume energy transfers into the area. Maryland is currently importing almost 30 percent of its electricity needs over bulk transmission systems stretching across West Virginia, Virginia, Ohio, Pennsylvania, and other PJM states. Economic congestion costs in Maryland's Pepco and BGE zones, detailed in Table 2-16, are driven by a shortage of low-cost generation in eastern PJM relative to western PJM.

[4] Monitoring Analytics, "2008 State of the Market Report for PJM," March 11, 2009

Table 2-16 Congestion Costs in Various PJM Zones for 2008

Zone	Total Annual Zonal Congestion Costs
Allegheny Power	$487.1 million
Baltimore Gas & Electric	$92.0 million
Delmarva Power	$96.4 million
Potomac Electric Power	$215.9 million

Notes: Table shows total zonal costs for AP, DP, and Pepco regions, therefore, not all of these costs are in Maryland.

Congestion costs in 2009 were lower than those in 2008; however, 2009 data were not yet complete at the time of document publication.

Source: Monitoring Analytics, "2008 State of the Market Report for PJM," March 11, 2009.

2.6.4 Investments in Transmission

New investment in transmission infrastructure has been lagging growth in electricity demand. Recognizing a lack of investment in transmission infrastructure, Congress directed FERC to establish rules that provide economic incentives for new transmission lines including incentive rate structures and tax incentives. It also directs the U.S. Department of Energy (DOE) to designate National Interest Electric Transmission Corridors (NIETCs).

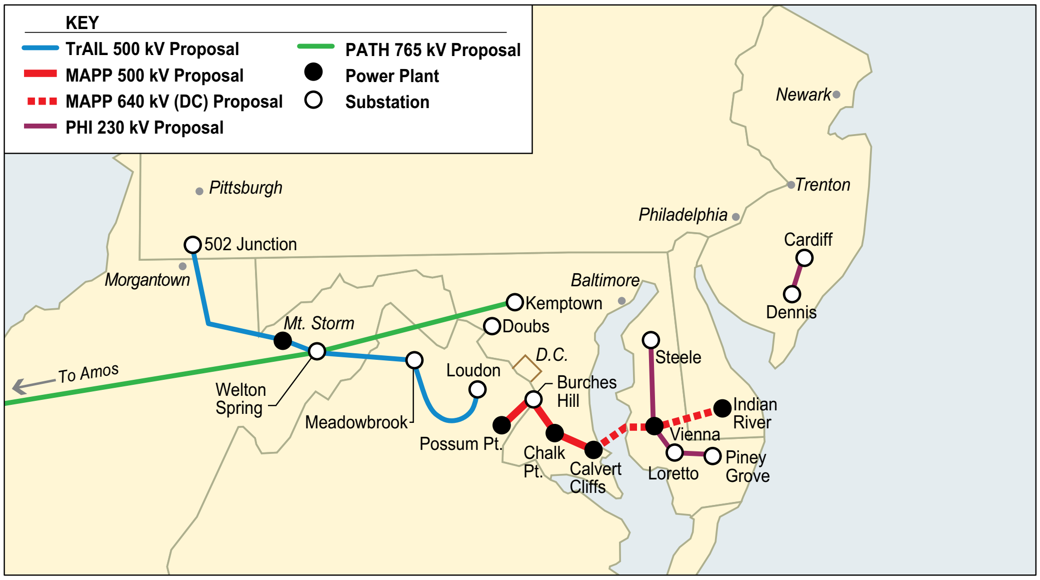
The first transmission projects to be awarded new rate incentives from FERC were the American Electric Power (AEP) Company and Allegheny Energy joint venture Potomac-Appalachian Transmission Highline (PATH) project and Allegheny Energy's Trans-Allegheny Interstate Line (TrAIL). FERC has conditionally approved incentive rates for these two large, high-voltage, multi-state transmission projects (see *Cost Recovery* below). In August 2008, FERC approved incentive rates for another regional high-voltage line, the MAPP Project. The PJM 2008 RTEP indicated that these three new backbone transmission projects will greatly enhance west-to-east power transfer and help alleviate the projected 2012/2013 reliability issues and reduce congestion costs. Table 2-17 provides information on these major backbone transmission projects proposed for the Mid-Atlantic region, all of which fall within the Mid-Atlantic NIETC. While the TrAIL line does not enter Maryland, the proposed PATH line is planned to cross and terminate in Frederick County, and the proposed MAPP line is planned to cross Charles, Prince George's, Calvert, Dorchester, and Wicomico counties, including the Chesapeake Bay, and terminate at Indian River, Delaware. All three lines were proposed to address reliability issues in Maryland and neighboring states (see approximate corridors in Figure 2-18).

Table 2-17 Proposed High-Voltage Transmission Lines in Mid-Atlantic

Line	Developer/Owner	Size (kV)	Length (miles)	Cost ($M)	Affected States	On-Line Date
TrAIL	Allegheny	500	149	$820	PA WV VA	2011
	Dominion	500	65	$150	VA	2011
MAPP	Pepco Holdings, Inc.	500 (AC) 640 (DC)	150	$1,200	VA MD DE	2012 (Western Shore) 2014 (Eastern Shore)
PATH	AE-AEP	765	275	$1,800	WV VA MD	2014

Note: AC = Alternating Current, DC = Direct Current

Figure 2-18 Approximate Corridors for Proposed New Transmission Lines



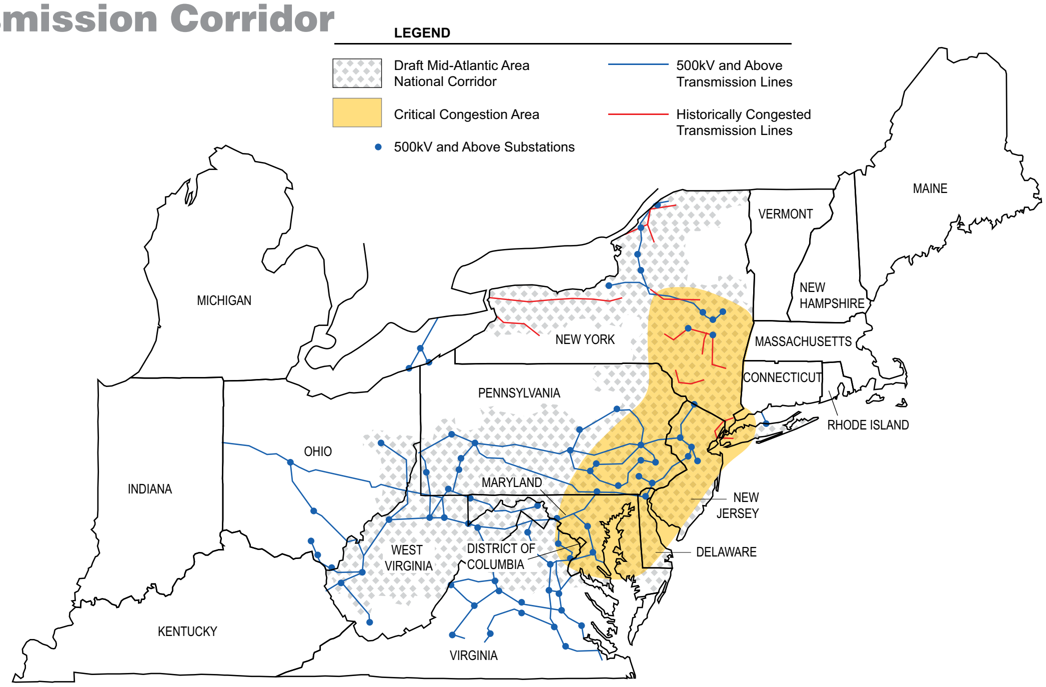
Smaller projects to address local reliability and load growth issues in Maryland are also being proposed. In November 2008, SMECO filed for a CPCN to construct a 30-mile 230-kV transmission line from the Holland Cliff switching station near Huntingtown in Calvert County to the Hewitt Road switching station in Lexington Park, St. Mary's County. In the filing, SMECO outlines four reliability issues it has identified that could result in the loss of service to customers for extended periods that this project would address. Additionally, the project would help SMECO meet demand growth for its customers in St. Mary's and Calvert counties for the next 30 years.

Cost Recovery

The cost of transmission upgrades and expansions are frequently included as part of the interconnection process between an electric generator and the transmission grid. Under an interconnection agreement, generators must provide the funding for the cost of any network upgrades and new additions to the transmission network that are required as a result of the interconnection. Generators are to be fully reimbursed for any network upgrade costs within five years. However, with the need for investment in backbone transmission lines that span various service areas and regions, the question of how to structure the cost recovery of major investments in transmission has become very complicated and contentious.

FERC issued Order No. 890 (February 2007), directing transmission providers to conduct local and regional level transmission planning in a coordinated, open, and transparent manner. As a result, the ISOs and RTOs have been engaged in various forms of regional transmission planning, including the development of innovative cost allocation systems to support the development of network expansions and upgrades that might not be included as generation interconnection. Each RTO has established cost recovery mechanisms that are slightly different. The allocation of costs for constructing transmission facilities in PJM are based on the size of the project and its total cost. Transmission lines rated at 500 kV and above are considered Regional Facilities and the cost for these facilities is assigned region-wide. Any lower voltage facilities needed to directly support integration of the high-volt-

Mid-Atlantic National Interest Electricity Transmission Corridor



The U.S. DOE identified the Mid-Atlantic region, from Ohio and West Virginia to northern New York, as one of two potential NIETCs. Subsequently, FERC designated this region, including all of Maryland, as the Mid-Atlantic Area National Corridor, with the area from Northern Virginia to New York City considered a critical transmission congestion area. NIETC designation means that additional transmission capacity in this area is so critical that the federal government (through FERC), under limited conditions, may overrule state utility commissions and issue permits for regional transmission line projects that are deemed to be in the national interest. Most intrastate and interstate electric transmission projects will continue to be approved by the states in which they are proposed. However, if a state fails to approve an eligible project within one year of its filing, FERC has the authority to consider an application and issue a permit to construct.

age line into the grid are included as regional facilities. Costs for projects $5 million or less are allocated to the zone in which the project is located. Projects rated below 500 kV and costing more than $5 million are allocated to the affected zones as follows:

- ***Baseline reliability upgrades*** *– these are upgrades identified as directly addressing a certain reliability violation. Costs are allocated to the relevant market participants (typically load) according to their contribution to the reliability violation as determined by PJM.*
- ***Economic upgrades*** *– those upgrades identified as cost-effective are paid for by the beneficiaries of the project. PJM determines the benefits and allocates costs to each zone according to its share of the total economic benefit.*

2.6.5 Siting Issues

As noted earlier, there are a number of proposed and approved transmission lines planned for Maryland that will address reliability, congestion and renewable energy access issues. There are also questions as to who has jurisdiction over siting these new lines. Traditionally, siting transmission lines falls under the purview of the states. The Energy Policy Act of 2005 however provided FERC with backstop siting authority through the designation of NIETCs in situations where the states are not responsive to these needs. Maryland is almost entirely within one of these corridors.

This authority was challenged in the 4th U.S. Circuit Court of Appeals. The Court determined that FERC had overstepped its authority with its interpretation of how transmission siting might take place under the NIETC provisions. The Court stated that if a state rejects a transmission project on reasonable grounds, the state cannot be overruled by FERC. FERC has asked for an *en banc* review of this decision, a reconsideration of the ruling that is less formal than an appeal process.

In spite of these challenges, there has been significant discussion about broadening FERC's ability to site and authorize the construction of new transmission lines, including lines developed specifically for the transfer of electricity from renewable energy projects to load centers. If plans to expand FERC's authority in siting transmission lines to move power from the central United States to load centers in the East are realized, there is a strong possibility that Maryland will be affected.

Federal Legislation and Transmission

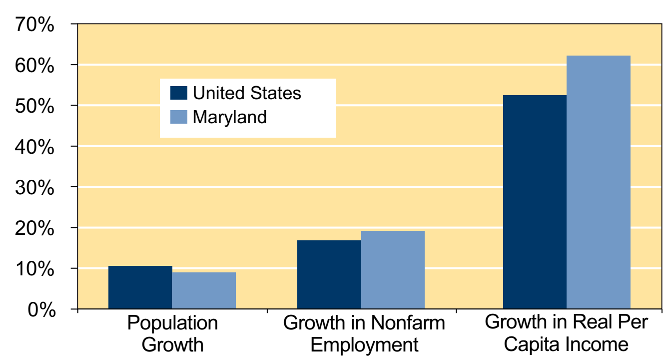
The American Recovery and Reinvestment Act of 2009 (ARRA), signed by President Obama on February 17, 2009, includes provisions for rapid deployment of renewable energy and electric power transmission projects including grants for up to $500 million for transmission projects. The ARRA also includes specific requirements for the 2009 National Electric Transmission Congestion Study, being prepared by the DOE. The final study must provide the following:

- *Analysis of the significant potential sources of renewable energy that are constrained in accessing appropriate market areas by lack of adequate transmission capacity;*
- *Analysis of the reasons for failure to develop the adequate transmission capacity;*
- *Recommendations for achieving adequate transmission capacity;*
- *Analysis of the extent to which legal challenges filed at the state and federal level are delaying the construction of transmission lines necessary to access renewable energy; and*
- *An explanation of assumptions and projections made in the study including those: 1) relating to energy efficiency improvements in each load center, 2) regarding the location and type of projected new generation capacity, and 3) regarding projected deployment of distributed generation infrastructure.*

2.7 Maryland Electricity Consumption

Maryland end-use customers consumed 65.9 million MWh of electricity during 2007. Between 1997 and 2007, the growth rate in electricity consumption in Maryland was significantly below that in the United States as a whole — 1.51 percent in Maryland versus 1.81 percent in the U.S. Figure 2-19 compares some of the key factors contributing to growth in electricity demand in Maryland and the U.S. from 1997 through 2007. Maryland's population growth has greatly slowed since 2001, as depicted in Figure 2-20, but per capita income and non-farm employment grew more rapidly than the national average. In general, as more people live and work in Maryland, and as incomes grow, they collectively use more electricity. The shares of electricity consumption in Maryland used by residential and nonresidential sectors (i.e., the sum of commercial, industrial, and street lighting) are similar to the United States as a whole (see Figure 2-21).

Figure 2-19 Comparison of U.S. and Maryland Growth Factors Affecting Electricity Consumption (1997 - 2007)



Source: Bureau of Economic Analysis, Regional Economic Accounts

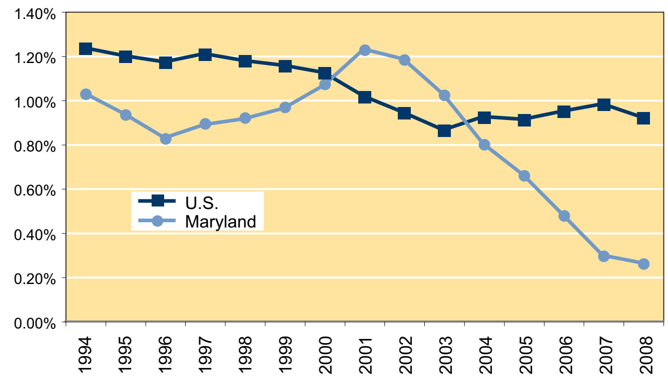
2.7.1 Maryland Electricity Consumption Forecast

Figure 2-22 illustrates the most recent forecast for future electricity consumption in Maryland, as projected by the utilities serving loads in the state. The slower growth in forecasted electric energy consumption compared to historical growth is largely attributable to projected increases in the real price of electricity and slower growth in population and employment. Higher electricity prices dampen the demand for electric power in two ways. First, the existing stock of electricity-consuming equipment and appliances is used less intensively because operation is more costly. Second, the stock of electricity-consuming equipment and appliances is adjusted over time by replacement with equipment and appliances that are more energy-efficient.

The impacts of energy price increases dampen the rate of increase in electricity consumption in Maryland, and the relatively slow growth in electricity consumption is projected to persist through the PJM 15-year forecast period (2008-2022). Over this period, consumption is expected to grow at an average annual rate of only 1.19 percent.

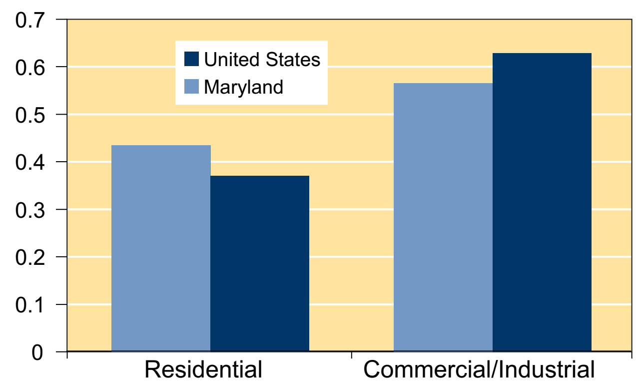
Future electricity prices (and hence consumption of electricity) are significantly affected by the recent large increases in natural gas prices. Between 1996 and 2006, natural gas prices almost tripled. Electricity generated from natural gas combustion accounts for only a small percentage of electric energy produced in Maryland (approximately 10 percent), but natural gas-fired facilities are often the marginal resources within the PJM Interconnection region and as such strongly influence market prices. In mid-2008, natural gas prices dropped significantly. In mid-2009, natural gas prices were below \$4.00 per mmBtu compared with prices of about \$13.00 per mmBtu in mid-2008.[5] Natural gas futures show market expectations that natural gas should move to between \$7.00 and \$8.00 per mmBtu by late 2011, which is reflective of general natural gas prices over much of the 2003 to 2007 period (see Figure 2-23). Based on these factors, we can anticipate declines in electricity prices throughout much of 2009, with moderate increases thereafter.

Figure 2-20 Population Growth Trends in Maryland and the U.S.



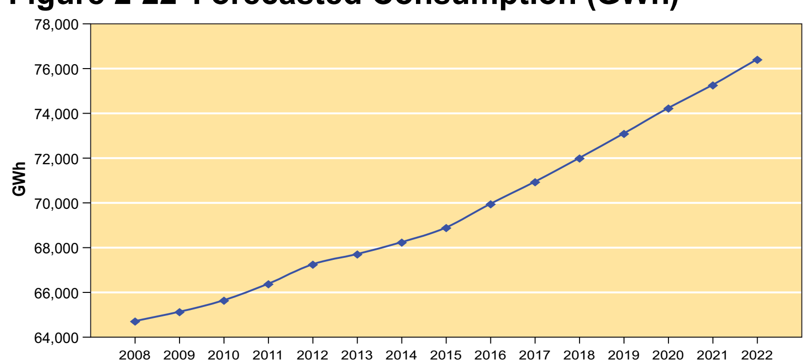
Source: Bureau of Economic Analysis, Regional Economic Accounts

Figure 2-21 Electricity Consumption by Customer Class (%) for 2007



Source: Energy Information Administration

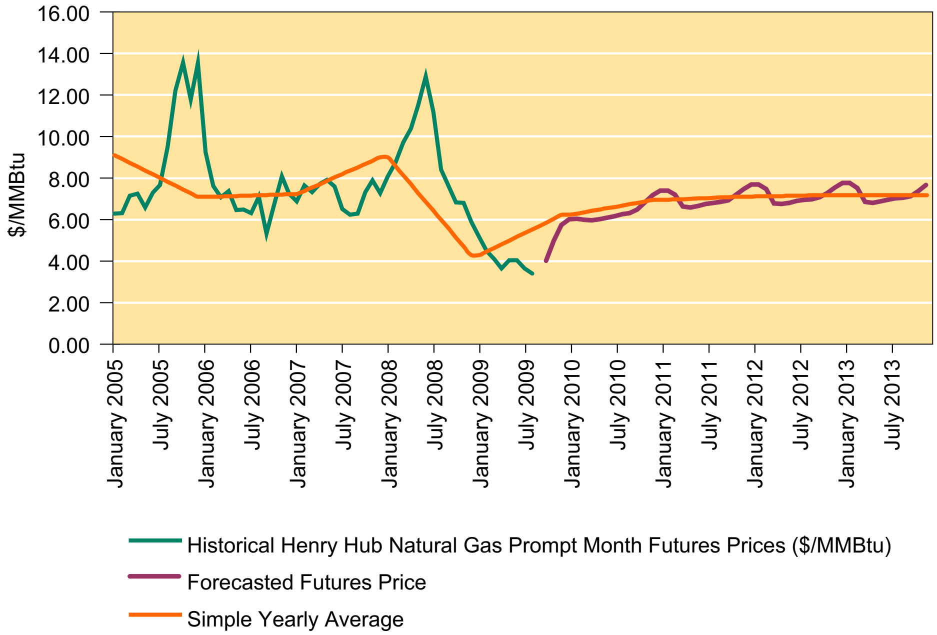
Figure 2-22 Forecasted Consumption (GWh)



Source: Maryland Public Service Commission Ten-Year Plan of Electric Companies in Maryland, February 2009.

[5] The natural gas prices used here are from the Henry Hub, a pricing point for natural gas futures contracts traded on the New York Mercantile Exchange (NYMEX). Henry Hub is a point on the natural gas pipeline system in Erath, Louisiana that interconnects with nine interstate and four intrastate pipelines: Acadian, Columbia G ulf Transmission, Gulf South Pipeline, Bridgeline, NGPL, Sea Robin, Southern Natural Pipeline, Texas Gas Transmission, Transcontinental Pipeline, Trunkline Pipeline, Jefferson Island, and Sabine.

Figure 2-23 Historical and Future NYMEX Henry Hub Natural Gas Prompt Month Futures Prices



The economic recession that began in 2008 and continued in 2009 has also resulted in significant downward pressure on electricity consumption in Maryland. While Maryland has not been as seriously affected by the recession as many other states, Maryland has in no sense been immune from the higher unemployment levels and lower levels of economic activity. The impacts of the economic downturn have overshadowed the impacts of the lower natural gas prices and resulting lower electricity prices. Electricity sales data for 2009 is not yet available, but we can expect to see either low levels of positive growth, or negative growth, owing largely to declines in economic activity due to the recession.

2.7.2 Generation: Comparison with Consumption and Future Outlook

The provision of adequate levels of electric power generation for Maryland consumers does not require that the level of power generation within Maryland's border match or exceed the state's consumption. Historically, Maryland's demand for electricity has exceeded the amount of energy generated within the state, necessitating imports from out of state resources. Maryland, as part of PJM, relies on the generating resources within PJM as a whole, as well as electric power that can be imported into the PJM area. Consequently, imbalances between Maryland consumption and generation should not be viewed as adversely affecting reliability or availability of electricity in Maryland. However, Maryland's high demand relative to its supply can produce high electricity prices when transmission limits and congestion require the use of higher cost electricity resources located closer to load centers.

Electric energy consumption in Maryland during 2007 exceeded electric energy generation in the state by about 29 percent. Table 2-18 compares actual and projected electricity consumption and generation in Maryland, assuming that proposed generating capacity additions are constructed and come on line by 2010. The 2010 electricity consumption in Maryland is expected to be about 65.6 million MWh, approximately 25 percent more than expected in-state generation.

Table 2-18 Total Maryland Electric Energy Consumption and Generation (thousands of MWh)

	Consumption	Generation - All existing & planned
2007	65,391	50,198
2010	65,631	50,331
Growth	240	133
Percent	0.37	0.53
Average Annual Growth Rates (percent)		
2006-2010	0.05	0.04

Note: Assumes no retirements and that planned expansions (through 2010) at the Riverside, Perryman and Rock Springs facilities are complete and operate at a 5% capacity factor.

BRAC Impacts in Maryland

Under the Base Realignment and Closure (BRAC) decisions made in November of 2005, Maryland is expected to gain close to 17,000 military jobs (see table below) and a total employment impact of 45,000 federal and private sector jobs by 2011. The Maryland Department of Business and Economic Development (DBED) projects an increase of about 28,000 new households in Maryland by 2011.

According to DBED's impact study in 2007*, growth pressures due to BRAC will be strongest in Harford and Cecil counties. Growth in population and households will likely encourage future economic growth and increase the amount of electricity consumed in Maryland.

Maryland BRAC Jobs by Installation

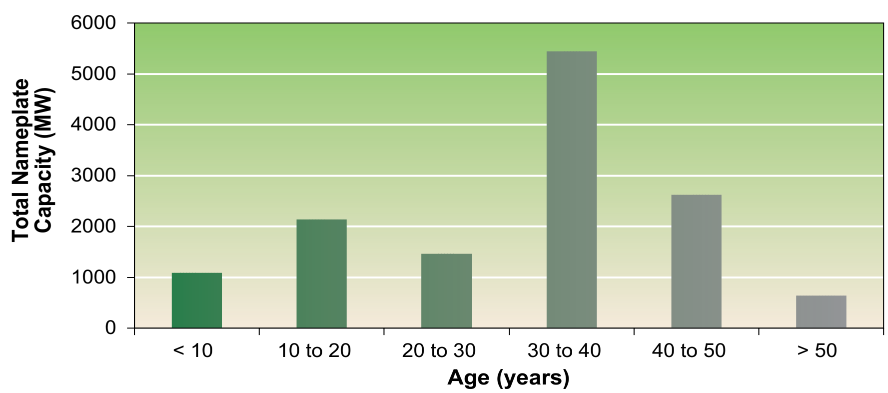
Base	Base Location	Jobs
Aberdeen Proving Ground	Harford	9,448
Andrews Air Force Base	Prince George's	400
Fort Meade	Anne Arundel	5,717
National Naval Medical Center	Montgomery	1,400
Total		**16,965**

The 2006 BRAC process had only a minor impact on the Patuxent Naval Air Station (Pax River) in St. Mary's County, Maryland, with a net gain of 87 jobs, most of which are civilian and contractual. However, Pax River was affected by earlier BRAC processes in 1991, 1993 and 1995, that relocated facilities in Warminster, Pennsylvania; Trenton, New Jersey; and Arlington, Virginia, to the Pax River facility. With the final BRAC decision of 1995, the Southern Maryland region was facing an influx of new residents and over 6,800 new jobs. At that time, Southern Maryland was the fastest growing region of the state. The number of customers served by Southern Maryland Electric Cooperative, the local utility serving Pax River, more than doubled between 1986 to 2006. Within SMECO's service area the annual electricity demand and energy sales have also more than doubled from 1986 to 2006.

* http://www.choosemaryland.org/businessinmd/militaryaffairs/BRACStudy.html

Aging of Maryland Generating Capacity

The graph below illustrates how much of Maryland's present generating capacity came on line 10 years ago, 20 years ago, etc. Because generating capacity is such a massive capital investment, power plant operators have generally made improvements necessary to keep plants running, even when that means making relatively expensive capital improvements. Constellation and Mirant recently initiated major projects at the seven largest coal-fired power plants in Maryland to comply with the new air emission control requirements of the Healthy Air Act, representing an estimated capital investment of $4 billion for all the plants combined (see further discussion on page X). Over the last 20 years, there has only been about 540 MW of generating capacity retired in Maryland — and 300 MW of that capacity is being considered for re-commissioning.



(This Page Intentionally Left Blank)