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# Maryland's Power Industry

The electricity industry is functionally separated into three independent businesses: generation and supply, transmission, and distribution. Customers are billed for each of the three separate functions, although most customers just receive one consolidated electric bill. The generation and supply of electricity are not regulated in Maryland and prices are set by the competitive wholesale and retail electricity markets. The distribution of electricity continues to be a regulated monopoly function of the local utility, and hence continues to be subject to price regulation by the Maryland Public Service Commission (PSC). The high-voltage bulk electric transmission system is also a regulated monopoly under the authority of the Federal Energy Regulatory Commission (FERC).

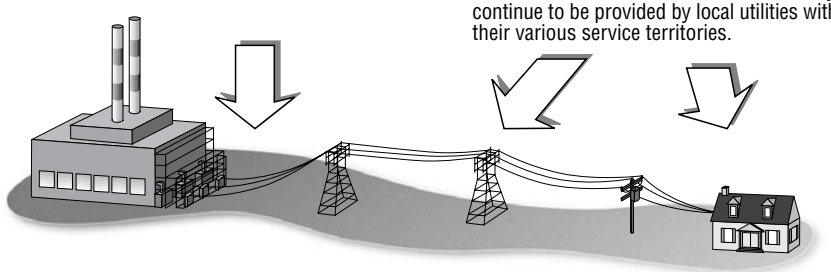
Retail competition provides Maryland consumers an opportunity to choose their electricity supplier. For more information about electric choice, contact the Maryland PSC Answer Center at 1-800-800-4491.

## Maryland's Electricity Market

**Generation** companies produce power for sale in the marketplace. Generation of electricity is a competitive industry in Maryland — customers can choose which supplier they will buy power from.

**Transmission** is the high-voltage interstate movement of power and **distribution** is the low-voltage local delivery.

**Transmission and distribution** of electricity continue to be provided by local utilities within their various service territories.

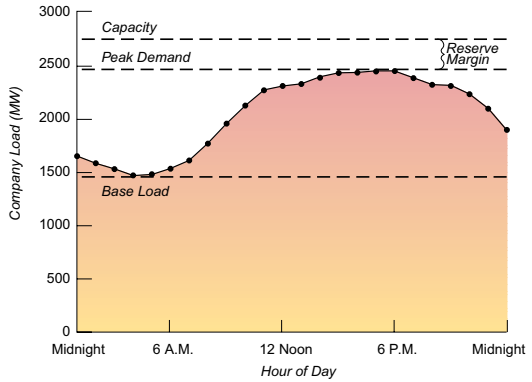


# Meeting the State's Electricity Needs

PJM Interconnection (PJM) — our regional transmission organization (RTO) — is responsible for balancing demand and supply as conditions change throughout the day. PJM tells generators when to send electricity out into the grid, according to the price for electricity. The power plants that are least expensive to run operate almost continuously to meet the minimum level of electricity that is demanded by a system (the baseload). These baseload plants are predominantly coal and nuclear plants since these plants, while expensive to construct, are relatively inexpensive to operate.



## Typical Load Profile




*Typical Summer Day*

Source: Actual data obtained from Conectiv

When consumers demand more electricity, the power plants that can quickly send electricity out onto the grid to meet peak demand are put into operation. These peaking plants, while expensive to operate due to fuel costs (typically oil or natural gas), are relatively inexpensive to construct.

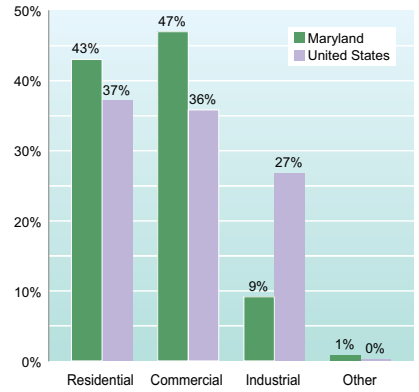
Another resource that PJM can utilize to meet peak demand is demand response. Demand response is achieved either through customers voluntarily shutting down some electricity-using systems, thereby reducing demand for electricity at that time (curtailment), or by using small, local generators and switching some local electricity use to those generators (distributed generation).

Residential and small commercial customers may purchase electricity from licensed competitive suppliers participating in the retail market. If customers do not choose a competitive supplier, then their local utility will provide electricity service under what is called Standard Offer Service (SOS).

## Electricity Sales in Maryland

Competitive suppliers tend to target the larger commercial and industrial customers and, consequently, serve approximately 56% of the state's commercial load and 94% of the state's industrial load. Competitive retail electric suppliers serve only a small minority (3%) of Maryland residential customers. Maryland does, however, have a larger proportion of residential and commercial sales than the U.S. as a whole but a much smaller proportion of industrial sales. The graph at the top of page 4 shows percentages of retail electric sales to the various customer classes. While the precise percentage varies slightly from year to year, Maryland imports approximately 25% of its electricity supply.

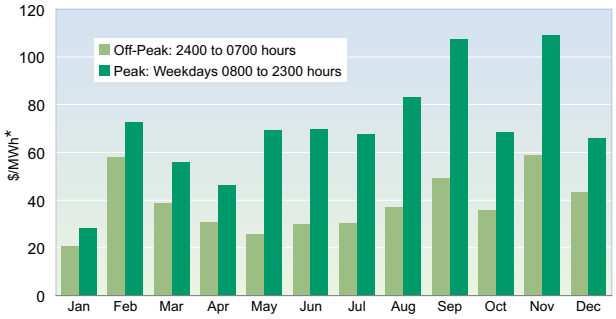
### *Retail Electric Sales in Maryland and the U.S. (2007)*




**Source: U.S. Energy Information Administration**

In 2007, electricity supply (i.e., generation) accounted for approximately 70% of total residential electricity costs, 76% of commercial costs, and 84% of industrial costs. Transmission costs represented approximately 3% of total costs for residential customers and 2% for commercial and industrial. The remainder (27% for residential, 21% for commercial, and 15% for industrial) was related to distribution charges. In 2007, Maryland's electricity users consumed approximately 69.2 million MWh of electricity. The following charts provide data on electricity rates in Maryland and the region.

### *Representative Peak and Off-Peak Wholesale Prices ($/MWh), PJM Region (2007)*




Source: PJM

* PJM reports this data in $/MWh. To convert data shown in this chart into cents per kWh, divide the number by 10.

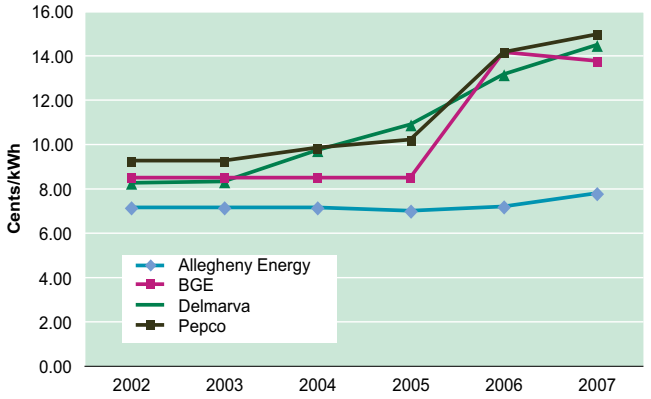
### *Typical Prices for Electric Service in 2007*

| | Residential | Commercial | Industrial |
|---|---|---|---|
| Typical Usage Billed (kWh/month) | 1,000 | 10,000 | 50,000 |
| Average per-kWh cost in Maryland (cents/kWh) | 13.0 | 12.3 | 10.3 |
| Average per-kWh cost in the Mid-Atlantic (cents/kWh) | 14.0 | 12.4 | 7.8 |
| Average per-kWh cost in the U.S. (cents/kWh) | 11.0 | 9.5 | 6.2 |

Source: Edison Electric Institute



### *Summer Electricity Rates for Residential SOS Customers*




Source: Maryland Power Plants and the Environment-CEIR-14, PPRP, February 2008.

Note: Allegheny Power residential rates are still frozen through 2008.

## *Transmission*

The transmission grid conveys electricity over a system of high-voltage electric lines extending between electric generators and distribution companies. Proper coordination and planning of the transmission system is critical to maintaining electricity reliability and the ability to provide adequate power supplies at reasonable prices. The map on page 7 illustrates the extent of Maryland's existing transmission network.

FERC regulates the interstate transmission of electricity, natural gas, and oil in the United States. FERC's responsibilities with respect to the electric industry include regulating the transmission system and wholesale sales of electricity in interstate commerce; ensuring the reliability of high-voltage interstate transmission systems; and monitoring and investigating energy markets. For more information see: www.ferc.gov.

The federal Energy Policy Act of 2005 authorized the North American Electric Reliability Corporation (NERC), an independent organization, to create mandatory and enforceable reliability standards for the interstate transmission system. At present, FERC has approved 83 of these mandatory reliability standards. Eight regional reliability councils, including the Reliability First Corporation (RFC), which covers Maryland and most of the PJM geographic footprint, are charged with assessing compliance with these standards.

The FERC-regulated PJM Interconnection dispatches and coordinates the flow of bulk power across the District of Columbia and all or parts of 13 states: Kentucky, Tennessee, North Carolina, Virginia, West Virginia, Maryland, Delaware, New Jersey, Pennsylvania, Ohio, Indiana, Illinois, and

Michigan. PJM consolidates the regional system's transmission needs into a single coordinated plan to ensure bulk power electric supply adequacy. PJM creates 5-year plans to undertake transmission system upgrades, as well as a 15-year plan for upgrades to high-voltage circuits (i.e., 230 kV and above).

Transmission congestion describes a situation in which lower cost power cannot reach its intended market because the transmission system is not able to carry the electricity. Typically occurring during periods of peak demand, congestion results from a constraint along the transmission line – either a physical, electrical, or operational limit. PJM electricity prices are called Locational Marginal Prices (LMPs) and vary across PJM according to zone. Transmission congestion can have a significant impact on these location-specific prices of electricity in the wholesale markets. Generators selling electricity in a zone with transmission congestion may be able to obtain higher prices than a generator with comparable operating costs located in a zone that is not subject to transmission congestion. LMP differentials between PJM regions are 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. PJM estimates that congestion added approximately $57.7 million in costs for BGE in 2007 and $66.6 million for Delmarva Power – the distribution utilities serving most of Central and Eastern Maryland. To reduce congestion and improve system reliability, a number of new transmission projects are being proposed, three of which would affect Maryland: the Trans Atlantic Interstate Line (TrAIL), the Potomac-Appalachian Transmission Highline (PATH), and the Mid-Atlantic Power Pathway (MAPP) (see map on page 8).

### *Average Annual LMP for 2007*

| | | | |
|---|---|---|---|
| Maryland | $69.61 | Pennsylvania | $58.72 |
| Washington DC | $70.25 | West Virginia | $48.39 |
| Delaware | $63.45 | Ohio | $45.69 |

Source: 2007 State of the Market Report, PJM MMU, March 2008

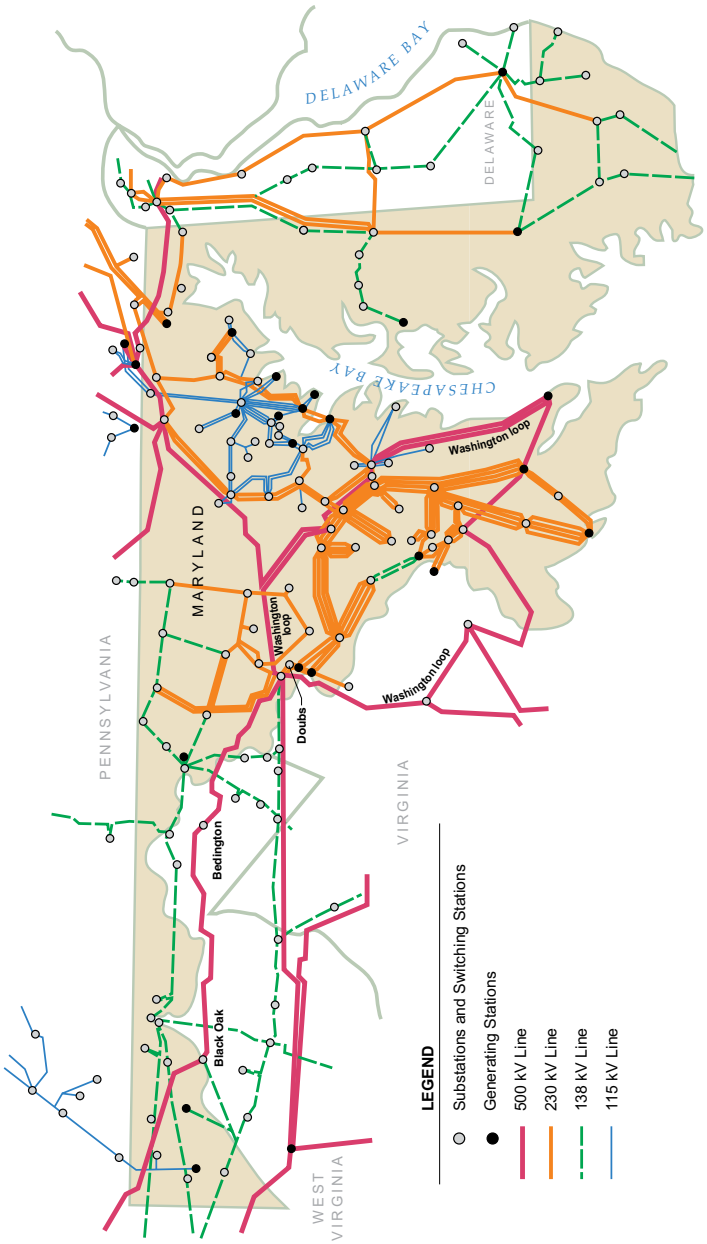
## Distribution

Distribution is the process whereby electricity is physically delivered to end-users. The Maryland PSC regulates and recognizes electric companies' monopoly franchises to deliver electricity to all customers within their respective service areas. As part of the monopoly franchise arrangement, the distribution companies are subject to price and other regulation by the PSC.

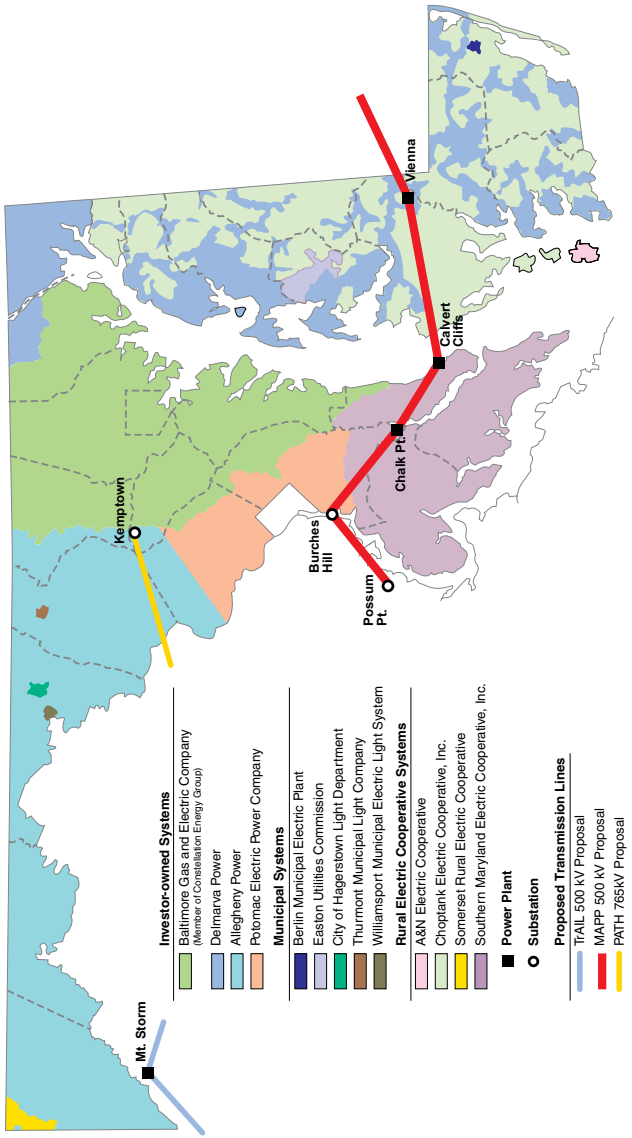
Three broad classes of electric distribution companies deliver power to retail customers in Maryland: investor-owned electric companies, municipal systems, and electric cooperatives. There are 13 electric distribution utilities in Maryland (see map of service areas on page 8). Of these, four are investor-owned systems, five are municipal systems, and four are electric cooperatives. More than 90 percent of electric service in Maryland is provided by the four investor-owned utilities. The remaining 10 percent of customers are served by rural electric cooperatives and municipal systems. The 13 electric distribution utilities serve over 2.4 million customer accounts in Maryland.



### *Maryland Transmission Lines (>115,000 Volts)*



## *Proposed Transmission Lines and Distribution Service Areas In Maryland*




### National Interest Electric Transmission Corridors (NIETC)

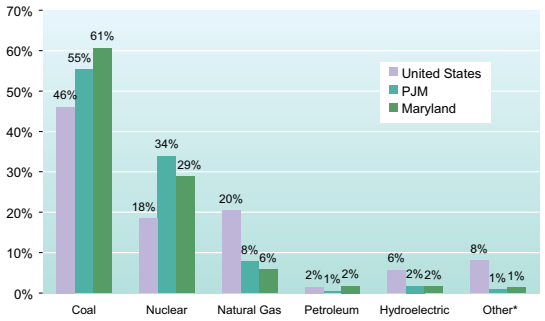
*The Mid-Atlantic region, from Northern Virginia to New York, has been designated as an NIETC. This designation means that additional transmission capacity is so critical that FERC, under limited conditions, may overrule state utility commissions and issue permits for regional transmission line projects that are deemed to be in the national interest. If state approval fails to be provided within one year of filing, FERC has the authority to consider an application and issue a permit to construct.*



# Generation

Coal is the primary fuel used to generate electricity in Maryland, with nuclear power being the second largest generation source. Maryland generates a larger portion of its electricity from coal and nuclear fuel than the United States as a whole, while natural gas is used by power plants to a larger extent in other areas of the country compared to Maryland.

## *Electric Generation (Energy Use) by Fuel Type for the U.S., the PJM Region, and Maryland (2007)*



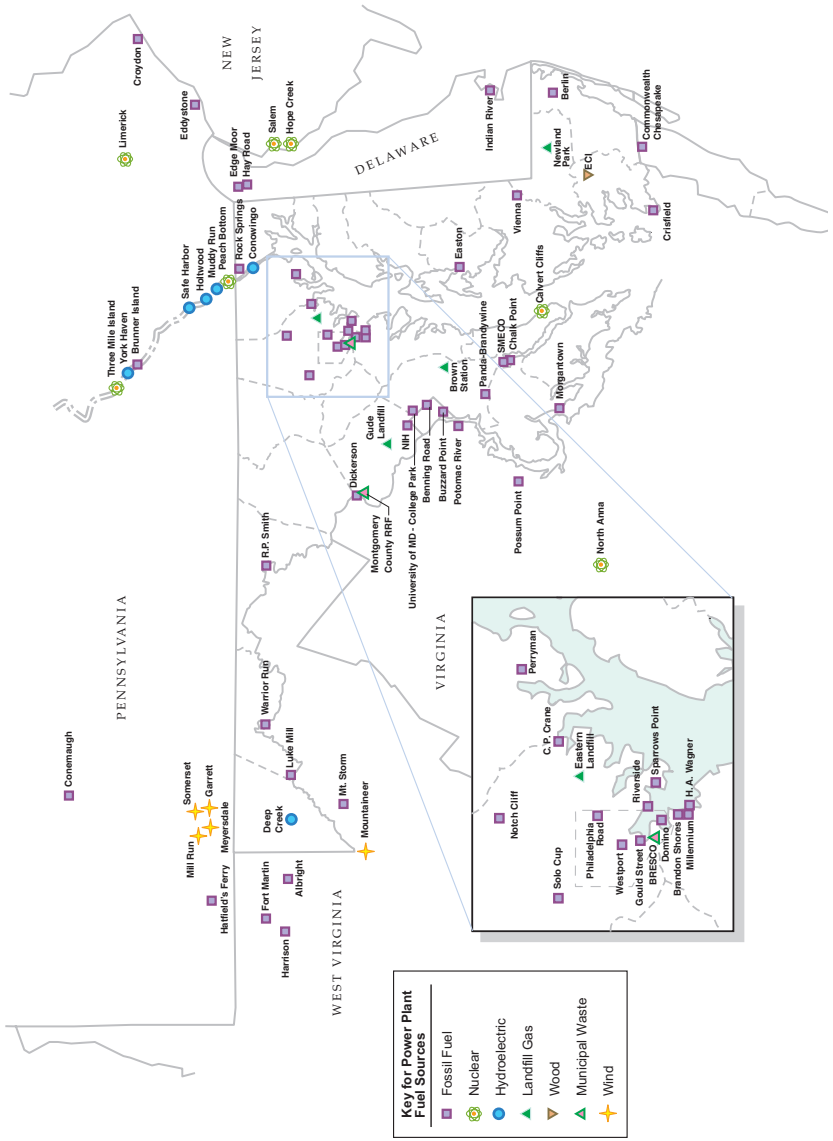

*Other capacity includes renewable generators, as well as waste, chemical and other miscellaneous generation sources.

Source: Energy Information Administration and PJM- 2007 State of the Market Report

The PSC has received more than 20 CPCN applications over the past eight years, representing several thousand megawatts of potential new generating capacity. While the majority of these proposed plants did obtain a CPCN, only 10 are now in operation, with the remainder being delayed or abandoned because of various financial or commercial reasons. The largest new project currently under consideration is the proposed third nuclear unit at the Calvert Cliffs site, with a net electrical output of about 1600 MW. If this project receives a CPCN (as well as all other necessary approvals) and is ultimately constructed, it would increase the existing generating capacity in Maryland by as much as 12%. The table on page 11 lists all generating units in Maryland that contribute 2 MW or more of capacity to the regional power grid.

In addition to centralized generating stations, distributed generation is becoming more widespread. Distributed generation generally refers to electricity generating equipment that is installed on the customer side of the meter and is typically used to serve on-site power needs. Distributed generators are not centrally dispatched by the regional grid operator. Distributed generation technologies include combustion engines, small wind, solar, small hydroelectric, and fuel cells, and can be used to displace electricity from the grid during times of peak demand.

# Power Plant Locations In and Around Maryland




## 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 | 1,600 |
| | C. P. Crane | Coal | 416 |
| | Gould Street | Natural Gas | 100 |
| | Notch Cliff | Natural Gas | 144 |
| | Perryman* | Oil/Natural Gas | 600 |
| | Philadelphia Road | Oil | 83 |
| | Riverside* | Oil/Natural Gas | 85 |
| | H. A. Wagner | Coal/Oil/Natural Gas | 1,059 |
| | Westport | Natural Gas | 121 |
| INGENCO | Newland Park Landfill | Landfill Gas | 6 |
| Mirant | Chalk Point* | Coal/Natural Gas | 2,563 |
| | Dickerson | Coal/Natural Gas | 930 |
| | Morgantown | Coal | 1,548 |
| Montgomery Country | Resource Recovery Facility | 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 |
| | Univ. of MD – College Pk. | Oil/Natural Gas | 27 |
| Susquehanna Power Co. and PECO Energy Power Co. | Conowingo | Hydroelectric | 550 |
| **Publicly Owned Electric Companies** | | | |
| Berlin | Berlin | Oil | 9 |
| Easton Utilities | Easton | Oil | 69 |
| Old Dominion Electric Cooperative | Rock Springs | Natural Gas | 770 |
| Southern MD 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 | 4 |
| OAO Severstal | Sparrows Point | Natural Gas/Blast Furnace Gas | 120 |
| New Page | Luke Mill | Coal | 65 |
| Solo Cup | Solo Cup – Owings Mills | Natural Gas | 11 |
| **Total** | | | **13,566** |

Source: Energy Information Administration, EIA860 Database, 2005

* Site of planned capacity expansions: Calvert Cliffs – 1710 MW, Perryman – 640 MW, Riverside - 85 MW

In addition, CPV St. Charles has proposed a 600 MW natural gas-fired project in Charles County, and windpower projects in Allegany and Garrett Counties, totaling more than 200 MW, are in various stages of planning.

# Renewable Energy, Energy Efficiency, and Demand Response

Renewable resources are those that are continually replenished and are not used faster than they can be replaced. Renewable energy resources include sunlight, tides, wind, and geothermal heat. There is growing interest in Maryland to encourage the use of renewable resources for generating electricity.

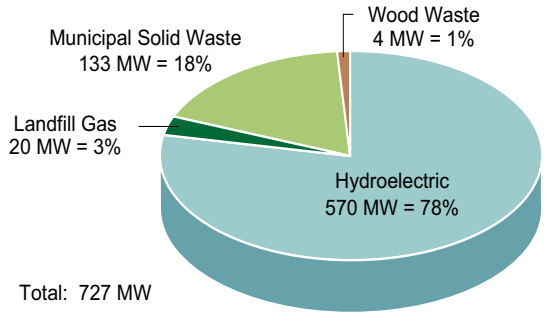
In 2004, the State legislature established a renewable energy portfolio standard (RPS) for Maryland. The RPS requires that a portion of all retail electricity sales in Maryland come from renewable resources. The RPS was amended in 2007 to include a solar power obligation and in 2008 to increase the required renewable percentages. Penalties are assessed for companies that fail to meet the standards.

As of the end of 2007, there were 160 renewable energy facilities certified with the Maryland RPS Program providing over 4,100 MW of capacity. Approximately 700 MW of this capacity is located within the State.

For more information about renewable energy, visit: http://energy.Maryland.gov.

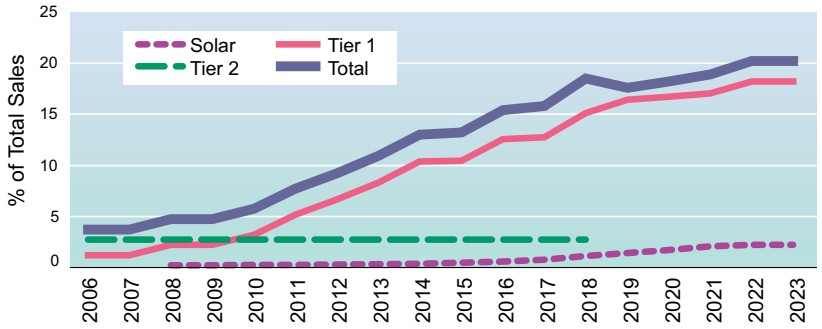
For more information about renewable resources in Maryland and their eligibility for inclusion in the RPS, follow the Program Activities link at: http://dnr.Maryland.gov/Bay/pprp .

### Maryland Renewable Electric Generating Capacity




Source: PPRP-CEIR-14, February 2008.

### Maryland RPS Requirement




Notes:

- Tier 1 resources: solar, geothermal, hydro facilities under 30 MW, methane, ocean, qualifying biomass, wind, poultry litter-to-energy, and fuel cells.
- Tier 2 resources: all Tier 1 resources plus waste-to-energy projects, incineration of poultry litter, and existing hydro facilities over 30 MW.
- A separate provision of the RPS requires suppliers to obtain 0.005% of their Maryland electricity sales from solar power sources beginning in 2008; the requirement grows to 2% by 2022.

Energy efficiency refers to finding ways to accomplish the same amount of work using less energy. Conservation refers to a conscious choice that a person makes to change behavior solely to use less energy (or other resources). Demand response refers to reducing demand for electricity when prices are high using efficiency, conservation, or alternative sources of electricity.

In July 2007, Governor Martin O'Malley announced a new energy efficiency initiative called EmPOWER Maryland with a goal of cutting Maryland's per capita energy consumption by 15% by 2015. For more information see: http://energy.Maryland.gov/facts/empower/index.asp.

Demand response enables end-use customers to reduce energy consumption during periods of high demand (and high prices). Voluntary usage reductions can be accomplished though cycling air conditioning and electric water heaters, for example. Additionally, customers can rely on their own distributed generation to reduce demand on the grid. For instance, there is increasing interest in small-scale solar as a distributed resource that can provide electricity and revenue to owners. Demand response incentives are available through the Maryland Solar Energy Grant Program. For more information see: http://energy.Maryland.gov/incentives/residential/solar-grants/index.asp.

*The U.S. Environmental Protection Agency's Energy Star ® Program (http://www.energystar.gov) offers extensive advice on how to save energy.*

# Environmental Aspects

The figure below illustrates some of the most significant effects associated with nuclear and fossil fuel fired generation – the technologies that provide the great majority of Maryland's electricity supply. For more information about these topics, as well as the potential impacts from other generating technologies (e.g., hydroelectric and wind power), please see the report "Maryland Power Plants and the Environment" (CEIR-14), available under the Program Activities link at PPRP's website: http://dnr.Maryland.gov/Bay/pprp.

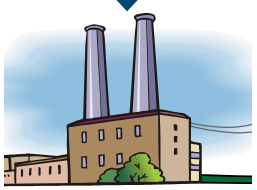
## INPUTS

**FUEL** - Potential impacts to water and land can result from oil and gas drilling, mining for coal and uranium, as well as accidental spills and releases.

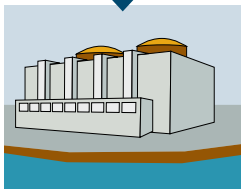
**WATER** - Surface and ground water withdrawals may reduce the amount of water available for other users.

Large volume withdrawals of surface water for cooling can affect small fish or other aquatic organisms drawn into the cooling system.

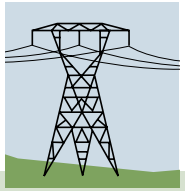
**Fossil Fuel Plant**



**Nuclear Plant**



**Transmission**



## OUTPUTS

**AIR EMISSIONS**

- Nitrogen oxides ($NO_x$)
- Sulfur dioxide ($SO_2$)
- Mercury
- Greenhouse gases

**SOLID BY-PRODUCTS**

- Fly ash
- Scrubber sludge

**RADIOLOGICAL WASTE**

High-level waste (spent fuel): Spent nuclear fuel is stored on-site under stringent NRC guidelines.

Low-level waste: Solid waste that is contaminated with radiation is trucked off-site for disposal at a licensed radioactive waste handling site.

**WATER DISCHARGES**

*(from either fossil fuel or nuclear facilities)*

Cooling water discharges can create thermal plumes (warm areas) in receiving water bodies.

Power plant discharges can also carry small amounts of chlorine or other chemicals used to control biofouling in cooling systems.

Transmission line construction can have significant effects on plants and animals:

- Alteration of wildlife habitat
- Forest fragmentation, especially as it impacts bird species
- Disturbance associated with construction that crosses wetlands or streams

In addition, major new transmission lines being proposed may allow existing coal- and oil-fired power plants to generate more electricity, creating more air pollution, including the transport of pollutants from other states.



# Glossary

*The following list provides definitions of selected terms that are commonly used in the electricity generating industry.*

**Base-load plant.** A power plant built to operate around the clock. Such plants typically have low operating costs and high capital costs. Coal and nuclear-fueled plants are typical base-load plants.

**British Thermal Unit (Btu).** A Btu is equivalent to 252 calories and serves as the base unit for measuring the heat content of a fuel source.

**Capacity.** The capability to generate electrical power, typically expressed in megawatts (MW).

**Congestion.** Describes a situation where power cannot be moved from where it is being produced to where it is needed for use because the transmission system does not have sufficient capability to carry the electricity.

**Conservation.** A conscious choice that a person makes to change behavior solely to use less energy (or other resources).

**Demand.** The amount of power that must be supplied to a customer (i.e., a load).

**Demand response.** Refers to shifting demand for electricity to non-peak periods or reducing electricity use during periods of peak demand.

**Distributed generation.** Generating resources located close to or on the same site as the facility using the power

**Distribution.** The process of delivering electricity received from transmission providers to local customers.

**Electric company.** The company that delivers electricity to a customer's home or business through its system of poles, power lines, and other equipment.

**Electric Cooperative.** An electric company that is owned by, and operated for the benefit of, those using the system.

**Electricity supplier.** An entity that sells electricity to customers (and, in Maryland, is licensed to do so by PSC).

**Energy efficiency.** Finding ways to accomplish the same amount of work using less energy.

**Energy use.** A measure of electrical power used over a period of time, usually expressed in kilowatt-hours or megawatt-hours.

**Federal Energy Regulatory Commission (FERC).** An independent commission responsible for regulating wholesale electric power transactions and interstate transmission and sale of natural gas for resale. FERC is the federal counterpart to state utility regulatory commissions.

**Generation.** The process of producing electrical energy.

**Independent Power Producers.** Private companies that develop, own, or operate electric power plants.

**Investor-owned utility.** A for-profit, tax-paying business.

**Load.** Kilowatt or megawatt demand placed on the electric system by consumers of power.

**Locational Marginal Price (LMP).** Electricity prices that vary by time and geographic location. Two separate PJM markets exist for the daily buying and selling of electricity. These are the Day-Ahead Market and the Real-Time Market. These markets operate on the basis of LMPs.

**Maryland Public Service Commission**. Government agency that regulates public utilities and certain passenger transportation companies doing business in Maryland, including gas, electric, telecommunications, water, sewage disposal, passenger motor vehicle, railroad, and taxicab companies.

**Municipal utility.** An electric company owned and operated by a municipality serving residential, commercial, and/or industrial customers usually within the boundaries of the municipality.

**Peak demand.** The maximum demand on an electric system in a designated period of time (e.g., over a year, a month, or a season).

**Peaking plants.** Power plants that operate for a relatively small number of hours, usually during peak demand periods. Such plants usually have high operating costs and low capital costs.

**Power Plant Research Program (PPRP).** A subdivision of the Maryland Department of Natural Resource, the PPRP functions to ensure that Maryland meets its electricity demands at reasonable costs while protecting the State's valuable natural resources. It provides a continuing program for evaluating electric generation issues and recommending responsible, long-term solutions.

**Regional Transmission Organization (RTO).** An RTO controls, operates, and may independently own the transmission facilities historically held by a region's vertically integrated public and private utilities. An RTO is an organization independent of the transmission facility owners. The RTO operates the high-voltage transmission grid to provide non-discriminatory access to the grid so that the lowest-priced wholesale power can be delivered to wholesale customers (e.g., load serving entities), while the owners still market and sell power. In Maryland PJM is the RTO.

**Reliability councils.** Regional organizations formed by the electric utilities to coordinate utilities' generation and transmission systems and monitor the availability of electric services.

**Renewable energy.** Sources of energy that are continually being replaced such as energy from the sun (solar), wind, geothermal, and hydroelectric.

**Renewable Energy Portfolio Standard.** Requiring that a portion of electricity supply comes from renewable resources.

**Retail competition.** Permitting end-use customers to contract directly with suppliers for their electric or gas service, while transmission and distribution companies provide for delivery of the service.

**Reserve margin.** Total system generating capacity minus annual system peak demand, divided by the annual system peak demand, expressed as a percent.

**Self-generator.** A generating facility that consumes most or all of the electricity it produces to meet on-site power demand.

**Standard offer service (SOS).** Electricity service that is provided to customers who do not choose an electricity supplier. Maryland's SOS service is based on competitive wholesale market rates.

**Time of use rates.** A utility rate structure that charges higher rates during peak hours of the day in an effort to shift peak period demand to off-peak hours.

**Transmission.** The process of delivering electricity from generation plants to entities that serve loads.

**Volt.** A unit of electrical pressure. 1kV = 1000 volts.

**Watt.** The electrical unit of power or rate of doing work. 1kW = 1000W. 1MW = 1,000,000 watts.

**Watt-hour.** An electric energy unit of measure that is equal to 1 watt of power supplied or taken steadily from an electric circuit for 1 hour.