Background on Electric Power Generation in Maryland

Introduction

Power plants in Maryland, as do all industrial facilities worldwide, affect the environment in various ways. For example, power plants emit air pollutants that affect local air quality and can contribute to worldwide problems such as acid rain and global warming. Some power plants in Maryland draw in large volumes of water from the Chesapeake Bay and local rivers, use it, and then discharge it back into the Bay and rivers, affecting local fish and shellfish stocks. Ash from Maryland's coal-fired power plants is collected and landfilled at various places in the state, which can degrade local ground water resources.

All of these activities affect the environment to some degree. Even though we acknowledge that we need power plants and transmission lines, we must still be concerned with how power plants affect the environment. What impacts *do* power plants have on the environment? Are the impacts significant? What are the costs to minimize these impacts? Who makes decisions regarding power plants and their potential impacts?

The Maryland Department of Natural Resources (DNR) **Power Plant Research Program** (**PPRP**) investigates how power plants impact Maryland's air, water, land, and cultural resources. In this role, PPRP is required by the Maryland Power Plant Research Act (§3-304 of the Natural Resources Article of the Annotated Code of Maryland) to prepare the **Cumulative Environmental Impact Report** (**CEIR**) every other year to summarize the information available on impacts to Maryland's environment from electric power generation and transmission.

This report is the ninth CEIR (CEIR-9) published by PPRP. As in past CEIRs, this report presents detailed results of a variety of specific environmental and economic studies conducted to evaluate impacts to Maryland's air, water, land, and cultural resources. These studies are discussed in Section 3. In addition to these environmental impact issues, Section 4 of CEIR-9 provides an update on several power plant related issues of special interest to Maryland, such as Chesapeake Bay programs, toxic substances, global climate concerns, and Western Maryland coal. Section 5 addresses a number of trends and developments in environmental, regulatory, and energy policy areas that affect how power is generated and distributed nationally and in Maryland. These include nuclear power plant issues, energy conservation efforts, and competition in the electric utility industry. Detailed information, including supporting materials and references, used to develop this report is found in a companion volume (Volume 2).

Any project to construct or modify a power plant or to build a new transmission line in Maryland must receive a license, referred to as a **Certificate of Public Convenience and Necessity** (CPCN), from the Maryland Public Service Commission (PSC). Section 2 of CEIR-9 describes the CPCN process and discusses some recent licensing cases. PPRP manages the consolidated review of CPCN applications, coordinating the involvement of state agencies and other interested parties. This is the only process within the state regulatory framework that allows a comprehensive review of all electric power issues. In fact, much of the information reported on in CEIR-9 is a direct result of the studies PPRP has coordinated as part of licensing proceedings.

The rest of this section of CEIR-9 describes the companies that operate power plants in Maryland, and reviews the most current information on energy demand and transmission issues.

Maryland's Electricity Suppliers

Electricity in Maryland is supplied principally by investor-owned utilities (IOUs). IOUs are large, vertically integrated firms that generate electricity, transport it over high-voltage transmission lines to population centers, and then distribute it to consumers. Three other types of companies supply electric power in Maryland:

- *municipal utilities,*
- *rural electric cooperatives, and*
- *non-utility generators (NUGs).*

A municipal utility owns the local distribution facilities in a specific town or city, generates electricity itself or buys wholesale power from another utility, and distributes it to local citizens. Rural cooperatives, which were established during the 1930s to provide electricity to rural America, serve larger areas in less populated portions of the state and borrow most of their investment funds from the federal Rural Electrification Administration. NUGs generate electric power and sell it wholesale to utilities, or in some cases, consume it on site. Unlike utilities, NUGs do not serve a franchise service area.

The amount of electricity generated by power plants in Maryland is not sufficient to meet the total power demands of the state's electricity consumers. Therefore, Maryland utilities import more than 35% of the state's electricity from power generating facilities located in neighboring states. These imports come from both power plants owned by Maryland utilities but located in other states and from long- and short-term power purchases from IOUs in other states. Because of the complex power operating agreements in the region, some of the energy generated in Maryland is actually exported to other states (see discussion of "power pools" later in this section). For example, although Maryland on balance is a net importer of power, Maryland power plants serve the power demands of customers in the District of Columbia and, occasionally, in Pennsylvania.

The service areas of Maryland's electric utilities are shown in Figure 1-1; power plants located in Maryland are shown in Figure 1-2.

Figure 1-1
Utility Service Areas in Maryland

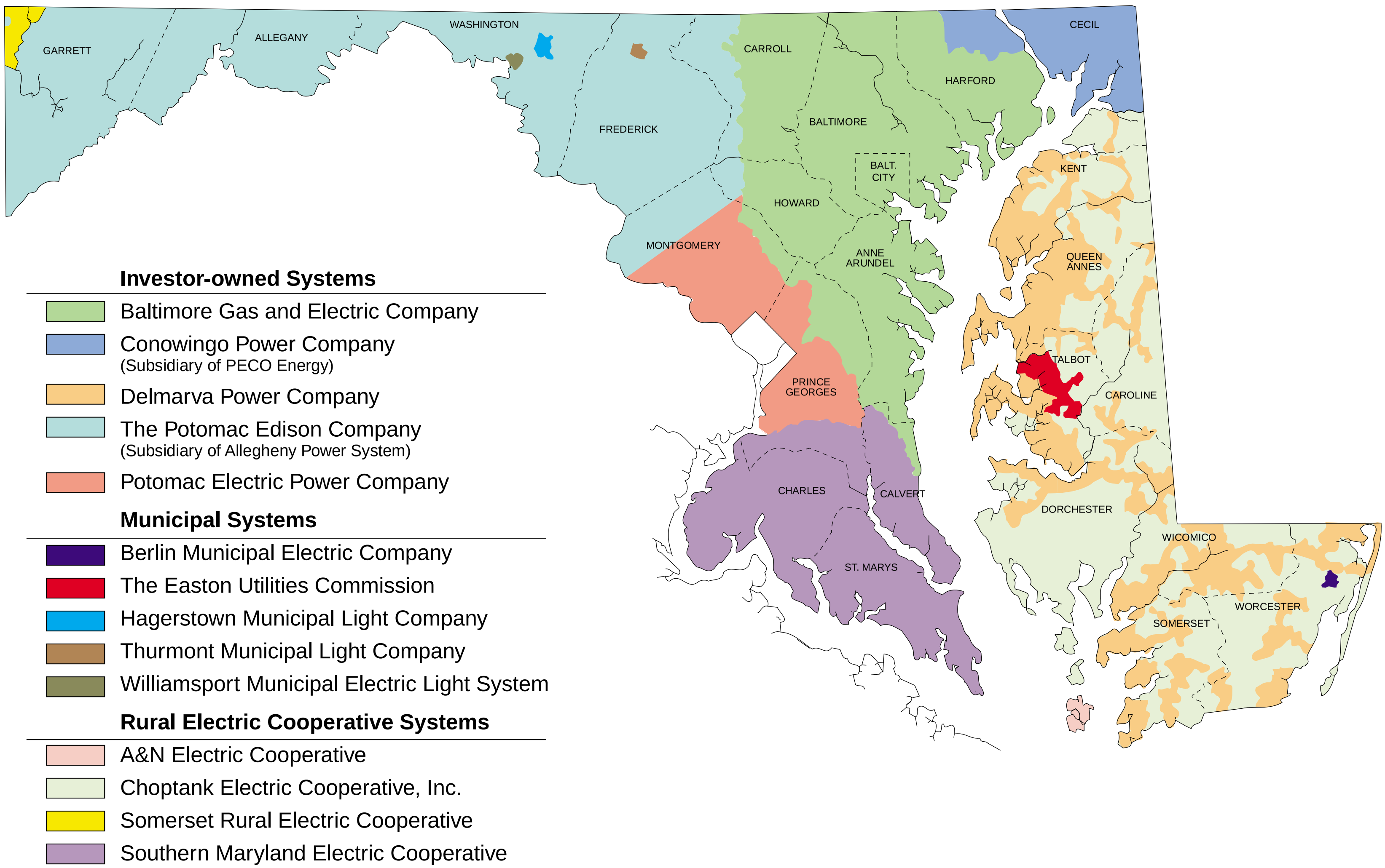
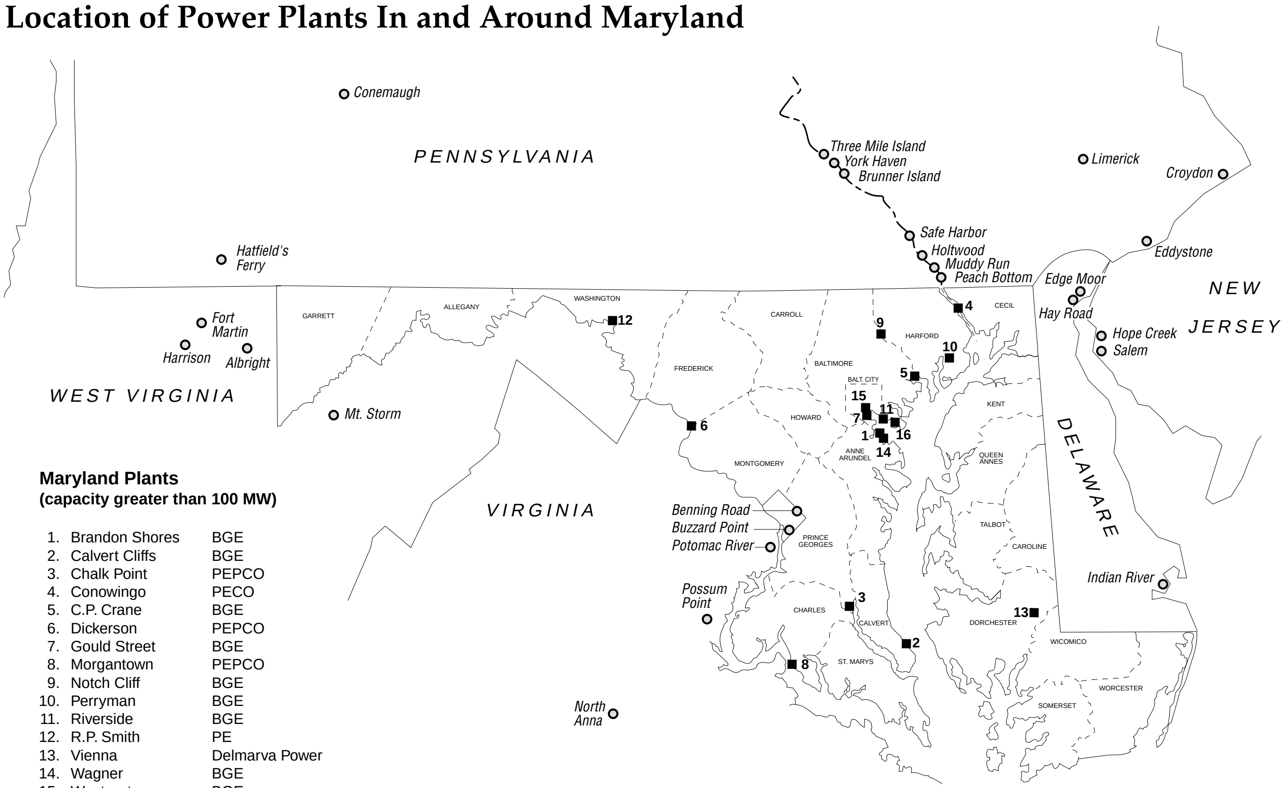


Figure 1-2
Location of Power Plants In and Around Maryland



Maryland Plants
(capacity greater than 100 MW)

1.	Brandon Shores	BGE
2.	Calvert Cliffs	BGE
3.	Chalk Point	PEPCO
4.	Conowingo	PECO
5.	C.P. Crane	BGE
6.	Dickerson	PEPCO
7.	Gould Street	BGE
8.	Morgantown	PEPCO
9.	Notch Cliff	BGE
10.	Perryman	BGE
11.	Riverside	BGE
12.	R.P. Smith	PE
13.	Vienna	Delmarva Power
14.	Wagner	BGE
15.	Westport	BGE
16.	Bethlehem Steel	BGE

Investor-Owned Utilities (IOUs)

Six IOUs operate in Maryland. Four of these are large integrated firms that generate, distribute, and sell electricity throughout the state:

- *Baltimore Gas and Electric Company (BGE),*
- *Delmarva Power,*
- *Potomac Edison Company (PE), and*
- *Potomac Electric Power Company (PEPCO).*

Until recently, there was another utility operating in Maryland, the Conowingo Power Company (COPCO), which obtained nearly all of its energy requirements from its parent company, PECO Energy Company (PECO), and served Cecil County in northeastern Maryland. However, in May 1994, PECO and Delmarva Power entered into an agreement whereby COPCO would be transferred to Delmarva Power and eventually will be merged into the Delmarva Power system. As part of the agreement, Delmarva Power will purchase firm capacity and associated energy from PECO for 10 years in an amount approximating the projected COPCO load (plus reserves). This acquisition is subject to various regulatory approvals.

Two other IOUs operate generating facilities in Maryland but sell no electricity at retail in Maryland:

- *Susquehanna Power Company, a wholly owned subsidiary of PECO, which operates the hydroelectric facility at the Conowingo Dam; and*
- *Pennsylvania Electric Company (Penelec), which operates a small hydroelectric facility near Deep Creek Lake in Garrett County.*

Baltimore Gas and Electric Company

BGE is a combination gas and electric utility serving the metropolitan Baltimore area. The electric service is provided to a 2,300-square-mile area with an estimated population of 2,625,000 and more than 1,000,000 customers. Large commercial and industrial customers account for 50% of total sales, residential 40%, and small commercial 10% of total sales. During 1993, BGE's system peak demand for electricity from all of its customers was 5,876 megawatts (MW), while its capacity resources provided a maximum of 6,726 MW of electricity. The system peak demand is expected to grow to 6,272 MW by the year 2004, which will require BGE to obtain more than 700 MW of new capacity to meet rising demand while maintaining an adequate reserve margin. Generating capacity at BGE's Riverside and Westport power plants, totaling 200 MW, will be retired within the next year.

In 1993, 38% of the electricity BGE supplied to its customers was from nuclear energy (the Calvert Cliffs Nuclear Power Plant), 48% from coal, 3% from oil and natural gas, and 11% from energy purchases. Of the generation required to meet BGE's energy requirements, 9% was imported from resources outside of the state.

Delmarva Power

Delmarva Power is also a combination gas and electric utility providing electric service to most of the Delmarva Peninsula. This is an area covering 5,700 square miles with a population of 800,000, consisting of the entire state of Delaware, portions of Maryland's nine Eastern Shore counties, and the two Virginia Eastern Shore counties — Accomack and Northampton. Delmarva Power serves approximately 390,000 customers. Retail sales in Maryland account for about 25% of Delmarva Power's total electric sales. In addition to retail sales, Delmarva Power sells electricity at wholesale to a Maryland municipality (the Town of Berlin) and to two rural cooperatives (the Choptank Electric Cooperative and the A&N Electric Cooperative).

In 1993, Delmarva Power's peak demand was 2,557 MW, compared to generating capacity resources of 2,856 MW. Delmarva Power expects its peak demand to grow to 2,773 MW by the year 2004, even accounting for the loss of 150 MW from Old Dominion Electric Cooperative, a cooperative in Virginia that plans to obtain its power from another source starting in 1995. Delmarva Power

The Energy Emergency of 1994

During the third week of January 1994, unusually severe winter weather caused electric utilities in Maryland and adjoining states to curtail and interrupt service to customers to protect the reliability of their systems. In Washington, D.C., daily high temperatures were the lowest in this century, and on January 19, the temperature reached -4°F. In Baltimore, the temperature on the 19th was -5°F, and the severe weather produced new high peak demands. PEPCO set a new winter peak of 5,010 MW on January 18, while BGE set a new system peak on January 19 of 6,038 MW.

Utilities had problems meeting these unexpected peak demands because of both planned and unplanned outages of major generating units. One significant planned outage involved more than 800 MW provided by Calvert Cliffs Unit 2. BGE initiated a planned maintenance outage on January 15 in preparation for a scheduled refueling outage in February. The unit was at zero power on January 17. Fuel problems at coal units throughout the mid-Atlantic region further reduced available capacity. Frozen coal at BGE's Brandon Shores plant on January 19 limited the capacity of both units to only 160 MW, or only one-fourth of their total capacity. Furthermore, several combustion turbine units in both the BGE and PEPCO systems were not available to meet peak demands because natural gas was not available or gas lines were frozen. Limited assistance was available from utilities to the west because they, too, were struggling to meet the extreme load conditions on their own systems.

Utilities responded to the emergency through a series of planned operational measures. Customers taking interruptible service were directed to reduce their loads; voltages were reduced by 5%; utilities operated units at emergency levels and shed 1,500 MW of customer load through rotating blackouts. Public television and radio appeals as well as the closing of businesses and government offices in Washington further reduced demand. In addition, BGE at Calvert Cliffs expedited critical maintenance activities, bypassed other non-essential maintenance, and commenced startup of Unit 2. Both of the units at Calvert Cliffs were on line by January 20. Together, these measures enabled utilities to continue service with only minimal disruptions until weather conditions abated and the emergency ended.

will require about 400 MW of additional generating capacity by 2004. Most of Delmarva Power's generating capacity is located in Delaware; the company has also proposed a major coal-fired plant to be located in Dorchester County, Maryland.

Potomac Edison Company

PE, which serves customers in Maryland, Virginia, and West Virginia, is one of three operating utility subsidiaries of the Allegheny Power System (APS), a utility holding company. PE serves 335,000 customers in a 7,193-square-mile service territory having a population of 730,000. During 1992, Maryland accounted for 67% of total PE sales. In Maryland, PE's customer base is heavily industrial, accounting for more than 50% of total sales. In addition, PE serves three Maryland municipalities at wholesale — the cities of Hagerstown, Thurmont, and Williamsport. The 1993-1994 PE system peak demand was 2,223 MW; generating capacity resources for PE in 1993 totaled 2,649 MW.

Potomac Electric Power Company

PEPCO provides service in metropolitan Washington, D.C. to more than 650,000 customers in a 640-square-mile area with a population of 1,900,000. This service area includes the entire District of Columbia and most of Prince George's and Montgomery Counties in Maryland. PEPCO also sells electricity at wholesale to the Southern Maryland Electric Cooperative (SMECO), which serves an area of 1,150 square miles in Calvert, Charles, St. Mary's, and a small portion of Prince George's Counties in southern Maryland. PEPCO is unique among Maryland IOUs in that it has no major industrial customers. In 1993, PEPCO's system peak demand was 5,754 MW and capacity resources totaled 6,576 MW. PEPCO's system peak under normal weather conditions was 5,327 MW in 1993. This peak is expected to increase to 6,154 MW by 2004, requiring PEPCO to obtain 662 MW of additional resources.

Publicly Owned Utilities

Two types of publicly or member-owned utilities operate in Maryland — municipal electric systems and rural electric cooperatives. Municipals include the systems operated by the cities of Hagerstown, Thurmont, and Williamsport, which buy their electricity from PE; the Town of Berlin, which buys most of its electricity from Delmarva Power and generates some electricity as well; and the Town of Easton, which is interconnected to Delmarva Power's system but has its own generating capacity. Rural electric cooperatives include SMECO, which owns one generating unit at PEPCO's Chalk Point site; A&N and Choptank, which buy power from Delmarva Power; and Somerset, whose energy is supplied by the Allegheny Electric Cooperative in Pennsylvania. A&N and Somerset serve only a few Maryland customers and operate mostly in neighboring states.

Non-Utility Generators (NUGs)

A small but expanding portion of Maryland's electric power supply comes from NUGs — power generation facilities owned and operated either by major industrial firms or private third-party developers. The power from these projects is either consumed on site (if, for example, the facility is located at an industrial plant) or sold at wholesale to the local electric utility.

Non-utility generators fall into four main categories:

- ***Cogenerators*** *produce electricity and usable thermal energy (typically steam) from the source. This normally involves the recovery of waste heat from the power plant boiler or exhaust, which substantially improves overall energy efficiency. Industries with large steam requirements tend to be good candidates as "steam hosts" for cogeneration. If the amount of steam produced is large enough, the cogenerator may be considered a qualifying facility (QF), which provides some advantages under federal rules.*

- ***Small power producers*** *are facilities 80 MW or smaller using a renewable resource or waste product as the principal fuel. This includes such sources of energy as municipal solid waste, solar, hydroelectric, wind, or waste coal. Small power producers are typically QFs.*

- ***Exempt wholesale generators*** *(EWGs) are a class of power suppliers, typically utility subsidiaries, that are exempt from the Public Utility Holding Company Act (PUHCA). EWGs must obtain federal certification to obtain the exemption.*

- ***Independent power producers*** *(IPPs) are NUGs lacking federal QF status (unlike cogenerators and small power producers). In theory, IPPs can be utility-owned, but normally do not provide service within the owning utility's franchise service territory. While lacking QF privileges, IPPs tend to have more flexibility in siting and engineering design than QFs. In the future, it is expected that many IPPs will be EWGs.*

Since the early to mid-1980s, there has been a growing realization that new electric power resources need not be provided by traditional utilities. It is now generally accepted that the function of electric power generation is no longer a "natural monopoly" and is subject to competition. Although NUGs currently represent only a small percentage of installed capacity nationwide, they are expected to provide a major portion of the growth in new capacity and they have heightened competition in bulk power markets.

NUGs are somewhat more prominent in the mid-Atlantic region than nationwide. They represented 6.0% of installed capacity in 1994, and are projected to account for 9.2% by 2003. Over the next ten years, NUGs are expected to account for nearly 40% of the new generating capacity additions in our region.

Non-utility generation has been slow to develop in Maryland compared with surrounding states and some other regions of the United States. Presently, there are approximately 300 MW of installed NUG capacity in Maryland from more than a dozen projects. Table 1-1 provides a list of all current NUG facilities of 10 MW or more in Maryland. Three projects account for nearly all the NUG capacity — 169 MW at Bethlehem Steel's Sparrows Point plant, 57 MW from the Baltimore Refuse Energy Systems Company (BRESCO) facility, and 50 MW from a power plant at the Westvaco paper plant. With the exception of BRESCO, the plants listed in Table 1-1 are traditional industrial self-generators, which installed capacity several decades ago to ensure reliable service and trim power costs.

Table 1-1 Current NUG Facilities in Maryland (10 MW or Larger)

Facility	Location	Purchasing Utility	Type of Facility	Size (MW)
BRESCO	Baltimore City	BGE	Waste	57
Bethlehem Steel	Baltimore County	BGE	Cogenerator	169
Westvaco	Allegany County	Self/PE	Waste	50
Domino Sugar	Baltimore County	Self/BGE	Cogenerator	10
			Total	286 MW

This situation is changing, but not dramatically. There are several NUG projects in the planning stage or under construction in Maryland (Table 1-2). The Maryland PSC has approved three planned contracts: AES-Warrior Run, Panda-Brandywine, and the Montgomery County solid waste facility. The projects total 450 MW, which represents a significant percentage of total planned capacity additions in Maryland over the next five years. Maryland utilities have also entered into power purchase agreements with NUG projects located outside of Maryland.

Table 1-2 Planned NUG Additions

Utility	Planned NUG Activity
BGE	Entered into a long-term contract with AES-Northside to purchase the power from a 300-MW coal-fired cogeneration plant that would enter service in the late 1990s. The PSC, however, rejected the contract as too expensive. BGE does expect to procure future capacity through competitive bidding after 2000, which may result in NUG additions.
Delmarva Power	Anticipates two major NUG projects entering service during the 1990s though competitive bidding programs. The 48-MW Star peaking unit entered service in 1992.
PE	At the present time, expects only one major project during the 1990s — the 180-MW AES-Warrior Run cogeneration plant in Allegany County. That contract has been approved by the PSC and the plant is scheduled for service in late 1999. The coal-fired Warrior Run project accounts for about 28% of the planned PE capacity additions during the 1990s. The 1999 on-line date represents a deferral obtained in a recent settlement agreement from a previously planned date of 1995.
PEPCO	Currently has two NUGs under contract to come on line in 1996 — the Montgomery County solid waste facility (about 40 MW) and the natural gas-fired Panda-Brandywine cogeneration plant (248 MW) located in Prince George's County. The Montgomery and Panda projects are under construction.

In an important decision, the Maryland PSC has ruled that NUG developers intending to construct power plants in Maryland are generally subject to the same power plant licensing rules as utilities. This means that NUG facilities built in Maryland now undergo the same comprehensive environmental review that utility-built power plants undergo during the licensing process (see Section 2).

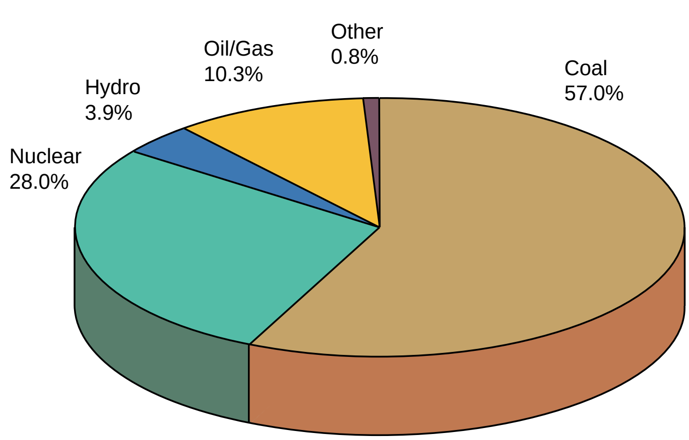
Electric Generating Capacity Of Maryland Utilities

Maryland utilities own and operate over 11,000 MW of generating capacity in Maryland. In addition, they own generating units and shares of units in other states. BGE and Delmarva Power own shares of the large Conemaugh and Keystone coal plants in Pennsylvania; PEPCO also owns a share of the Conemaugh plant. Delmarva Power owns shares of the Peach Bottom nuclear plant in Pennsylvania and the Salem nuclear plant in New Jersey, and operates several fossil fuel plants in Delaware. PE owns shares of steam plants that are located in West Virginia and Pennsylvania. BGE has an entitlement to the Safe Harbor hydroelectric plant in Pennsylvania, and PEPCO is the sole owner of the Potomac River coal plant in Alexandria, Virginia, and several oil units in the District of Columbia. In total, this comes to almost 18,000 MW of capacity, both in Maryland and out of state, owned by Maryland utilities.

Table 1-3 lists the power plants owned by Maryland utilities, existing generating capacities at each plant, and planned capacity additions or reductions over the next several years. This table includes existing NUG plants whose total output is purchased by a utility, and proposed NUG facilities with long-term contracts that have been approved by the Maryland PSC.

The principal fuel burned at Maryland's power plants is coal, which in 1993 accounted for roughly 57% of the generation in Maryland. Figure 1-3 illustrates the generation in Maryland in 1993, by fuel. Nuclear generation, represented by BGE's Calvert Cliffs plant, accounted for 28% of total generation in the state in 1993.

Figure 1-3
Fuel Used to Generate Electricity in Maryland in 1993



How is Electricity Generated in Maryland?

In Maryland, three types of generation technologies provide the bulk of the electricity:

- steam turbines (both fossil fuel-fired and nuclear-powered boilers),
- combustion turbines, and
- hydroelectric units.

Steam turbine power plants are the most common generation technology in Maryland. A steam turbine is an enclosed rotary device in which the energy of high-temperature, high-pressure steam is converted to mechanical energy. This mechanical energy is used to drive generators that produce electricity. Steam turbine plants in Maryland use either fossil fuels (coal, oil, or natural gas) or nuclear fission to produce steam. Steam electric stations in Maryland burn mostly pulverized coal, reflecting the national trend during the 1970s and 1980s toward coal and away from oil or nuclear fission as the primary fuel.

Combustion turbines are the second most common power generation technology in use in Maryland. Combustion turbines use compressors to draw air from the atmosphere and pressurize it. The compressed air is then directed to the combustor where it is mixed with either oil or natural gas and ignited. The energy of the combustion product is converted to mechanical energy by expansion in a turbine. Due to the relatively high cost of oil and gas, combustion turbines are primarily used to provide peaking power, that is, to help meet short-term demands for electricity when demand is highest.

Hydroelectric power, the third major generation technology in Maryland, uses the energy of moving water to produce electricity. Potential energy in the form of stored water behind a dam is converted to kinetic energy when drawn by gravity though the dam's conduits. The amount of electricity generated is dependent upon how far the water "falls" (head) and how much water is flowing. In a hydroelectric system, flowing water pushes against turbine blades to drive generators and produce electricity. The principal hydroelectric plant in Maryland is the 512-MW Conowingo Facility located on the Susquehanna River.

Table 1-3 Current and Planned Generating Capacity in Maryland Utility Systems

Utility	Plant Name	Major Fuel Type	Capacity (MW) Current	Capacity (MW) Planned Increase (Decrease)
BGE	Brandon Shores	Coal	1,288	—
	Calvert Cliffs	Nuclear	1,660	—
	C.P. Crane	Coal	394	—
	Gould Street	Oil	104	—
	Notch Cliff	Natural Gas	128	—
	Perryman	Oil/Natural Gas	208	140
	Riverside	Oil/Natural Gas	391	(199)
	H.A. Wagner	Coal/Oil	1,005	—
	Westport	Oil/Natural Gas	248	(126)
	Philadelphia Road	Oil	64	—
	Bethlehem Steel[1]	Natural Gas	169	—
	BRESCO[1]	Waste	57	—
Out-of-State:	Conemaugh	Coal	181	—
	Keystone	Coal	358	—
	Safe Harbor	Hydroelectric	277	—
	Subtotal		**6,532**	**(185)**
PEPCO	Chalk Point	Coal/Natural Gas	2,339	—
	Dickerson	Coal/Natural Gas	837	269
	Morgantown	Coal	1,412	—
	SMECO[2]	Natural Gas	84	—
	Montgomery County[3]	Waste	—	40
	Panda-Brandywine[3]	Natural Gas	—	248
Out-of-State:	Benning Road	Oil	550	—
	Buzzard Point	Oil	256	—
	Conemaugh	Coal	166	—
	Potomac River	Coal	482	—
	Subtotal		**6,126**	**557**
PECO (Susquehanna)	Conowingo	Hydroelectric	512	—
Penelec	Deep Creek Lake	Hydroelectric	20	—
PE	R.P. Smith	Coal	114	—
	AES-Warrior Run[3]	Coal	—	180
Out-of-State:	Albright	Coal	76	—
	Harrison	Coal	629	—
	Hatfield's Ferry	Coal	332	—
	Pleasants	Coal	375	—
	Bath County	Pumped Storage	235	—
	VA & WV Hydro	Hydroelectric	11	—
	Subtotal		**1,772**	**180**
Delmarva Power	Vienna	Oil	168	—
	Dorchester	Coal	—	300
	Crisfield	Oil	10	—
Out-of-State:	Christiana	Oil	45	—
	Conemaugh	Coal	63	—
	Edge Moor	Coal/Oil	708	—
	Indian River	Coal	781	—
	Keystone	Coal	63	—
	Peach Bottom	Nuclear	157	—
	Salem	Nuclear	167	—
	Hay Road	Natural Gas	511	—
	Diesels	—	77	—
	Subtotal		**2,750**	**300**
Easton	Easton	Oil	47	46
Berlin	Berlin	Oil	4	5
TOTAL			**17,763**	**903**

[1] NUG

[2] The SMECO facility is located at PEPCO's Chalk Point Station. PEPCO operates the unit and is entitled to the full output of the unit under a long-term contract.

[3] Proposed NUG

Power Pooling

To gain the efficiency and reliability benefits of interstate and intrastate power transactions, the Maryland utilities participate in multi-utility **power pools**. PE and its two utility affiliates form the APS Power Pool. PEPCO, BGE, and Delmarva Power are members of the Pennsylvania-New Jersey-Maryland Interconnection (PJM) Power Pool, which also includes most of the electric utilities in Pennsylvania, New Jersey, the District of Columbia, and Delaware.

The PJM pool employs an operating procedure known as **economic dispatch** to minimize fuel costs for all members. With economic dispatch, a utility system makes maximum use of its generating units with the lowest operating costs (coal, nuclear, and hydroelectric plants) and only uses units that are more expensive to operate (oil- or gas-fired units) when the lower cost units are already running at their maximum levels. PJM implements this process by collecting plant operating data on all member plants and continuously determining the pool-wide cost of generating an additional kilowatt-hour (the incremental cost). It operates all of the member utilities' units as a single system; at each hour, generation is added from the most economical source available, regardless of utility ownership, to meet the next increment of load. This results in continuous buying and selling of power among the members, referred to as **interchanges**. Through this system of economic dispatch, PJM as a whole realizes substantial fuel cost savings and distributes those savings among its members. In addition, power pooling enhances reliability of service and enables the member utilities to maintain smaller reserves.

In PJM, such reliability benefits are realized principally through long- and short-term planning for the adequacy of generation. PJM's capacity requirements are determined using the one-day-in-ten-years reliability criterion and include capacity that may be available in neighboring systems. These requirements are then allocated among member utilities. Currently, Delmarva Power and BGE use an 18% planning reserve margin to meet their PJM capacity obligation. PEPCO uses a 16% reserve margin. The determination of capacity requirements on a pool-wide basis permits members to share reserve capacity, thereby reducing the amount of capacity they would otherwise be forced to hold.

Energy Imports and Exports

Because electricity sales to Maryland customers are greater than the amount of electricity generated in the state, a substantial quantity of energy is imported from neighboring states. Three utilities — BGE, Delmarva Power, and PEPCO — import energy from the Conemaugh and Keystone plants in western Pennsylvania (plants in which the three utilities hold partial ownership). Delmarva Power also imports electricity from both the Peach Bottom nuclear power plant in southern Pennsylvania and the Salem nuclear plant in southern New Jersey. PEPCO and BGE import substantial amounts of power from Ohio and Pennsylvania under long-term contracts. Maryland's status as a net importer of power is due principally to Delmarva Power and PE. Both companies have substantial customer bases in Maryland but at present generate very little energy in Maryland.

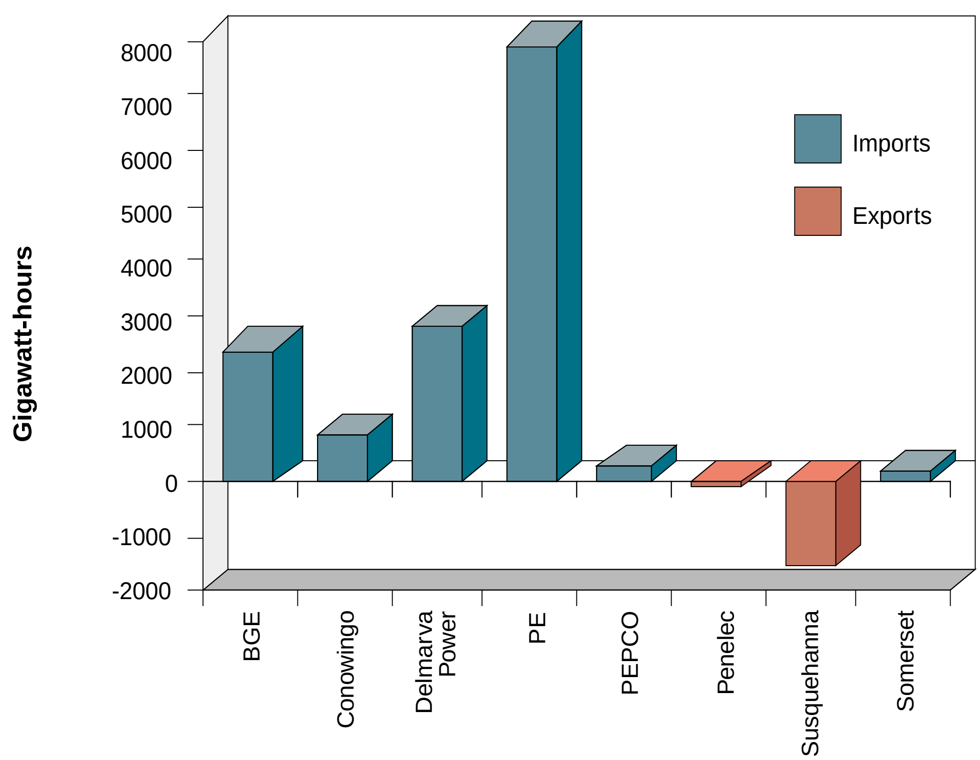
Table 1-4 compares energy sales in the state, adjusted for losses, with the amount of energy generated in the state. The difference is the energy imported. The amount of electricity imported to and exported from Maryland in 1993 is shown in Figure 1-4.

Table 1-4 Exports and Imports of Energy into Maryland in 1993 (gigawatt-hours)

	BGE	COPCO	Delmarva Power	PE	PEPCO	Susque-hanna	Penelec	Somerset	Totals
Retail/ Wholesale Sales *	28,022	810	3,239	8,210	16,075	0	0	155	56,512
Generation	25,634	0	460	286	15,811	1,627	65	0	43,883
Imports (Exports)	2,388	810	2,779	7,924	264	(1,627)	(65)	155	12,629
Imports as Percent of Sales	8.5%	100.0%	85.8%	96.5%	1.6%	NA	NA	100.0%	22.3%

*Includes transmission and distribution losses

Figure 1-4
Maryland Energy Imports and Exports, 1993



The Role of Transmission

Transmission facilities, consisting of high-voltage lines and transformers, play an integral role in providing electricity to the state's consumers. Transmission serves three principal functions. First, transmission lines connect generating facilities to load centers. This enables Maryland utilities to locate some of their large power stations in remote areas, or in other states, some distance from major load centers. Second, transmission systems enhance the reliability of the state's electric supplies by providing interconnections with neighboring utilities that may be able to provide assistance in times of emergency. Finally, in conjunction with membership in the PJM and APS power pools, transmission systems enable utilities in Maryland to reduce operating costs using the process of economic dispatch described earlier. Figure 1-5 shows the high voltage transmission grid in Maryland and neighboring states. The 500-kilovolt (kV) system is shared by Maryland utilities and PJM members in Pennsylvania, New Jersey, and Delaware. The system is also shared by PE, other members of the APS pool, and other utilities in western Pennsylvania.

Figure 1-5 illustrates the connections between generating stations and load centers in and around Maryland. BGE's Calvert Cliffs nuclear generating unit is connected by two 500-kV lines to the Baltimore-Washington metropolitan area. PEPCO's major generating facilities at Chalk Point, Dickerson, and Morgantown are connected to the Washington, D.C. metropolitan area through 230-kV lines. Delmarva Power's load on the Eastern Shore is connected to the company's generating facilities through 230- and 115-kV lines. Finally, PE's system is connected to company facilities located in other states through the 500-kV and lower voltage lines from the APS system in West Virginia and Pennsylvania.

One important addition to transmission facilities in the state was completed in May 1994 when two line segments were energized to complete the 500-kV loop around the Washington, D.C. area. One segment connects BGE's Calvert Cliffs plant with PEPCO's Chalk Point plant. A second segment connects BGE's Waugh Chapel substation with PEPCO's Brighton substation. The loop solidly ties the Calvert Cliffs and Chalk Point plants into the power grid and enhances access to power from the rest of PJM and neighboring power pools by BGE and PEPCO.

The 500-kV network in APS and PJM also delivers to Maryland utilities their share of the output of jointly owned generating stations in other states. These include the Conemaugh and Keystone coal plants in Pennsylvania and the nuclear units at Peach Bottom in Pennsylvania and at Salem in New Jersey. Beyond this, the high voltage grid makes possible PEPCO's 450-MW, 20-year capacity purchase from Ohio Edison Company. All Maryland utilities at various times have also used their share of the high voltage line system to purchase lower cost energy from APS and other utilities to the west of Pennsylvania. Because of the availability of such low cost energy in the west over the last several years, the high voltage lines connecting Maryland utilities to the APS system are heavily loaded most of the time.

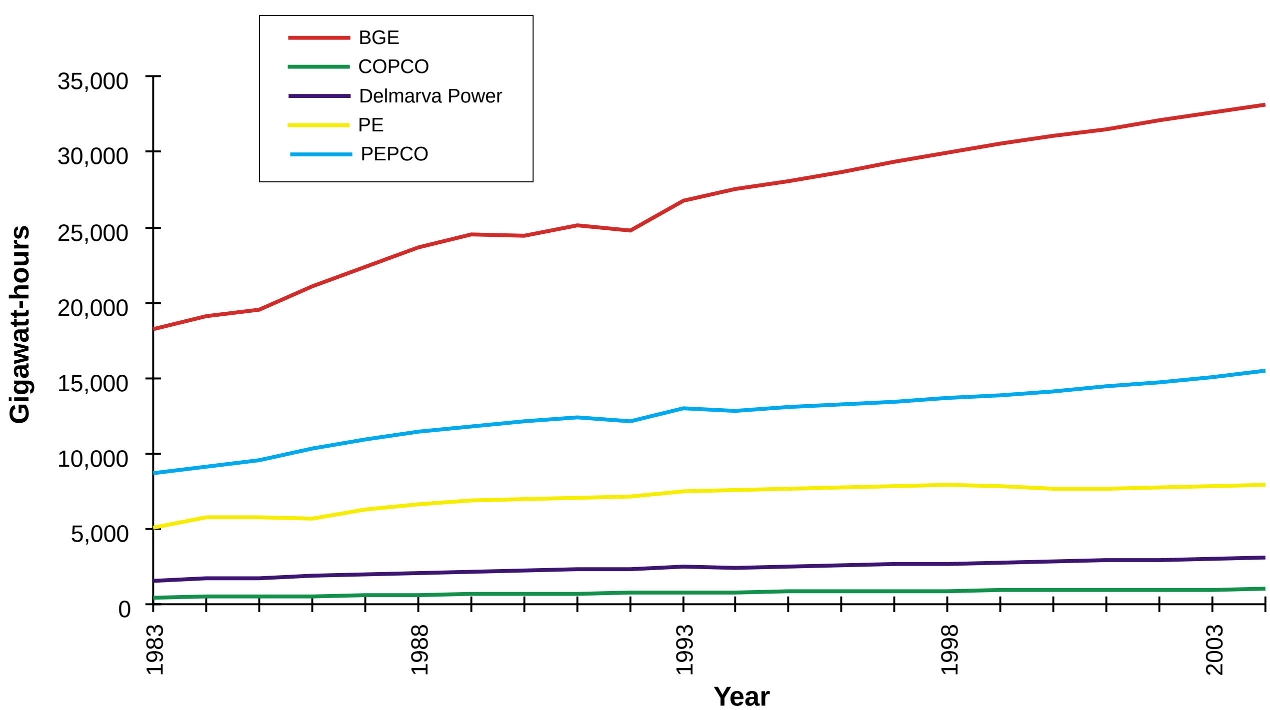
Maryland's Electricity Users

Users of electricity in Maryland are generally classified as residential, commercial, industrial, or governmental. Overall, usage of electricity in Maryland is 60% non-residential and 40% residential, although each utility's customer base is different. Municipalities and rural cooperatives tend to sell a somewhat larger percentage of their total energy to households than do the larger IOUs. Figure 1-6 shows how the IOUs' total retail sales have changed over the past 11 years, and how they are projected to grow.

Most of Maryland's manufacturing industry is located in the service territories of BGE and PE, so a higher proportion of these two utilities' sales are to industrial customers. In fact, most of the total sales for these two utilities are to the primary metals industry in Maryland, because PE provides service to Eastalco Aluminum Company and BGE serves the Bethlehem Steel Company.

Energy sales in Maryland are expected to continue to grow, but at a slower rate than they have been recently. From 1983 to 1993, the annual rate of growth in energy sales in Maryland by Delmarva Power, BGE, COPCO, PE, and PEPCO (the five utilities accounting for more than 94% of all retail energy sales in the state) ranged from 3.9 to 5.3%, and averaged 4.0%. Over the period from 1994 to 2004, the annual rate of growth in energy sales is projected to range from 0.5 to 2.3%, for an average of 1.7%.

Figure 1-6
Retail Sales of Major Maryland Utilities*



*Information projected for 1994 and beyond

The factors most significantly affecting electricity demand in Maryland include growth in population, income, and employment; however, the large gains experienced in these areas in much of the state during the late 1980s is not expected to be repeated in the 1990s. Demand also depends upon the price of electricity, the energy efficiencies of electricity-using equipment, and the mix of business activities in the state. Maryland, along with the United States as a whole, is shifting to a more service-oriented economy, which tends to use less energy than heavy manufacturing on a per-worker basis. All of these factors are responsible for the slower rates of growth in electricity demand expected over the coming decade.

Conservation and Demand-Side Management in Maryland

Since the mid-1980s, Maryland utilities have actively engaged in promoting **demand-side management** (DSM) programs as a means of deferring power plant construction and meeting growing customer demands. DSM programs fall into two basic categories: 1) **load management** and 2) **conservation**.

The first category, load management, refers to utility programs designed to reduce customer's electricity usage at the peak hours of the year or to shift demand from the high-usage peak hours to the low-usage off-peak hours. If successful, load management allows utilities to defer building or buying new generating capacity (which is driven by peak demand growth) and to use existing baseload units more efficiently. While reducing peak hour demand, load management programs have little or no effect on total energy usage.

The second category, conservation, refers to utility-sponsored programs that meaningfully reduce customer's total energy demands. Such programs usually, but not always, are intended to achieve peak hour demand savings as well. In general, conservation programs can help the utility defer new power plant construction and also save fuel.

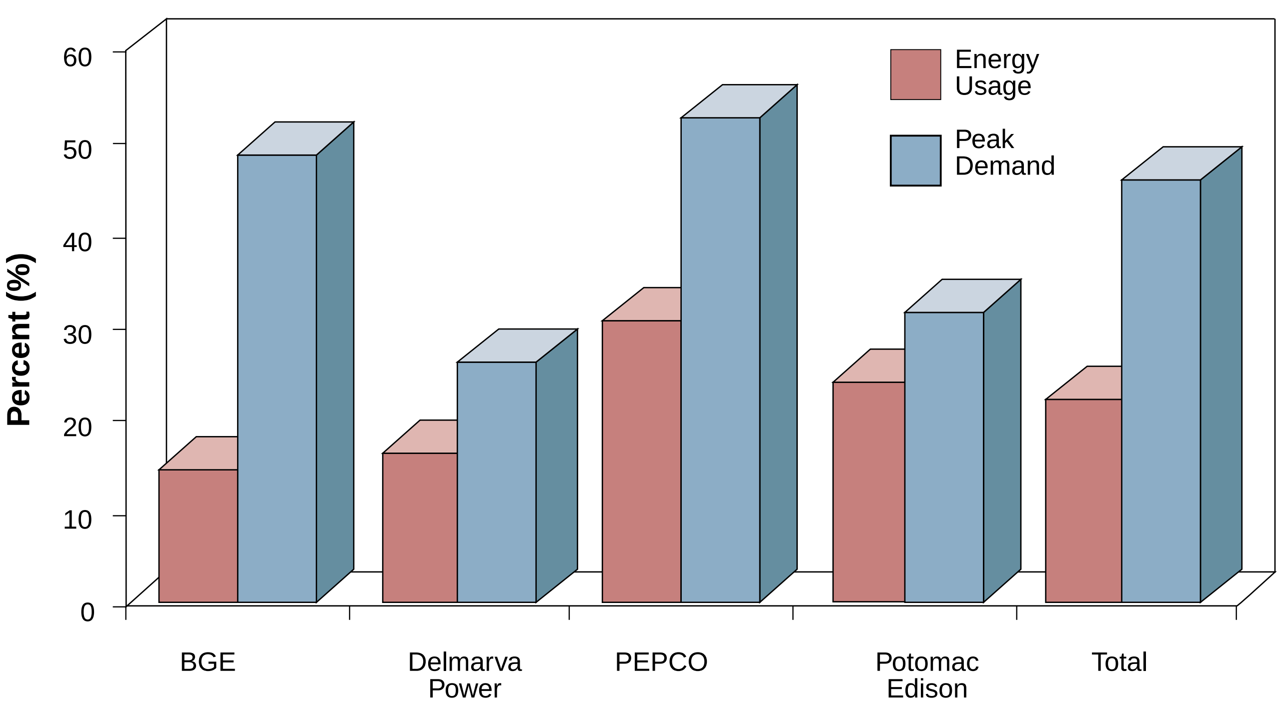
In the mid-1980s, an acceleration in load growth prompted Maryland utilities to heavily emphasize load management, which was viewed as a cost-effective tool for reducing the large power plant construction burdens that utilities were facing at the time. The most important programs introduced or expanded at that time included interruptible or curtailable service to large business customers, time-of-day pricing for both residential and non-residential customer groups, and air conditioner/water heater cycling. Most of these programs could be introduced at relatively low cost, with participating customers receiving attractive rate discounts.

Utilities placed comparatively less emphasis at that time on conservation programs. Programs undertaken during the 1980s consisted mainly of home energy audits, conservation advertising, new home energy efficiency certifications, low income weatherization, and technical advice for customers. Approximately five years ago, utility sponsorship of conservation began to expand substantially, with the major change being the introduction of financial incentives in the form of customer rebates to encourage the purchase of high-efficiency equipment and appliances.

The expansion of conservation programs has required a large scale commitment of financial resources, with utilities spending tens of millions of dollars per year on program costs and rebates. In addition, to the extent successful, such programs imply a loss of retail sales revenue for the sponsoring utility. As a result, large scale conservation efforts on the part of utilities could not take place without changes to standard ratemaking practice. Under standard ratemaking, the increase in expenditures and loss of revenue from conservation programs would lead to an unacceptable deterioration in utility earnings between rate cases. To address this disincentive, the Maryland PSC has approved in recent years special surcharges for the recovery of utility conservation expenditures and losses in base revenue due to conservation programs. The surcharges also provide for incentive bonuses for the utility based upon a share of the net customer savings attributable to DSM. The surcharge method of cost recovery has effectively eliminated the disincentive to conservation program sponsorship that Maryland utilities previously faced.

It must be emphasized that substantial conservation efforts have been achieved, and will continue to take place, outside of utility-sponsored programs. Since the early 1980s, manufacturers have introduced and consumers and businesses have purchased electric equipment and appliances with increasing energy efficiencies, in response to market forces. In the late 1980s, federally mandated appliance efficiency standards were issued to be phased in during the 1990s. The 1992 Energy Policy Act mandated additional appliance efficiencies. The role of utility-sponsored conservation programs is to supplement and perhaps accelerate these existing market forces and federal standards, not replace them.

Figure 1-7
Percentage of Power Demand Growth Over the Next Ten Years to be Met by DSM Savings for Maryland Utilities



DSM Trends in Maryland

Maryland utilities are at various stages in the development and introduction of DSM programs. However, for all four major Maryland electric utilities, DSM is currently projected to meet a substantial percentage of the growth in power demands over the next 10 years. For Maryland's four major electric utilities, Table 1-5 shows the projected energy and peak demand growth over the next 10 years. Figure 1-7 illustrates the percentage of power demand growth, both energy usage and peak demand, to be met by DSM savings. Although there is considerable variation among the four utilities, in each case DSM is expected to meet a substantial transportion of the 10-year demand growth. For peak demand, DSM savings range from 26 to 53%, with the average for the four utilities at 46%. Utility conservation will meet a somewhat smaller percentage of the energy growth, ranging from 14 to 31% over the next 10 years.

Table 1-5 The Role of DSM in Meeting the Growth in Power Demands for Maryland Electric Utilities (1994-2003)

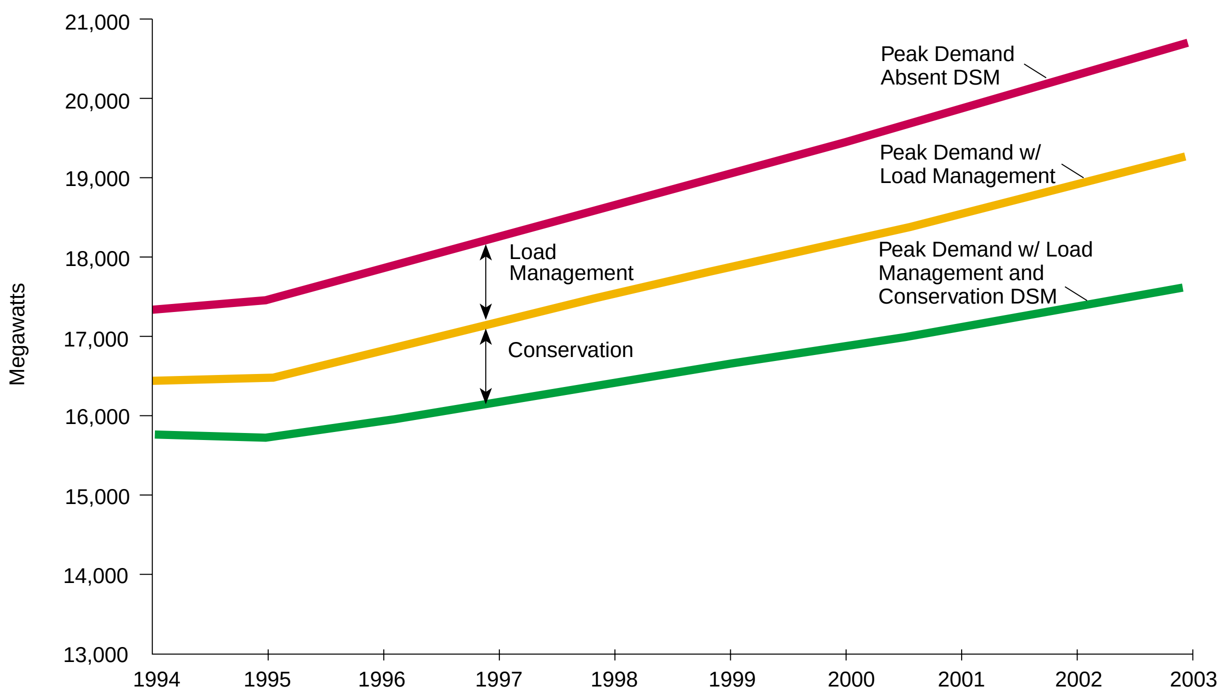
	Projected Energy Use w/o DSM to be met			DSM Savings			
Utility	**1994**	**2003**	**Growth**	**1994**	**2003**	**Increase by DSM**	**% of Growth**
			Energy Usage (GWH)				
BGE	29,811	36,105	6,294	448	1,353	905	14.4%
Delmarva Power*	11,233	13,432	2,199	99	455	356	16.2
PEPCO	27,660	34,438	6,778	706	2,781	2,075	30.6
PE	12,372	13,982	1,610	325	704	379	23.5
Total	**81,076**	**97,957**	**16,881**	**1,578**	**5,293**	**3,715**	**22.0%**
			Peak Demand (MW)				
BGE	6,230	7,360	1,130	607	1,151	544	48.1%
Delmarva Power*	2,533	3,037	504	245	376	131	26.0
PEPCO	5,950	7,247	1,297	520	1,201	681	52.5
PE	2,507	2,963	456	172	314	142	31.1
Total	**17,220**	**20,607**	**3,387**	**1,540**	**3,042**	**1,548**	**45.7%**

*For Delmarva Power, 1995 was used as the base year due to the loss of ODEC load between 1994 and 1995.

Considerable caution must be exercised in making cross utility comparisons. Differences in DSM growth projections on that table may be due to a number of utility-specific factors including the projected rate of growth in power demands (without DSM), inherent conservation or load savings opportunities, utility cost structures and other features. For example, since Potomac Edison is winter peaking, programs which primarily reduce summer peak demands might not have much value.

The projected peak demand savings from DSM for Maryland utilities is shown on Figure 1-8. The savings from DSM on Figure 1-8 is divided between load management and conservation programs. The middle growth path shows what projected peak demand would be if only load management programs were included in the projections, while the bottom growth path subtracts out all planned DSM. Hence, the vertical difference between the middle and bottom paths is the estimated peak demand savings from utility conservation programs.

Figure 1-8
Projected Peak Demand for Maryland Utilities
With and Without DSM Savings*



*Based on the sum of projected peak demand and DSM peak demand savings of BGE, Delmarva Power, PEPCO, and PE.