Schreiner

PPRP-CEIR-9/2

PPRP

Maryland Power Plants and the Environment

A review of the impacts of power plants and transmission lines on Maryland's natural resources

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MARYLAND POWER PLANT RESEARCH PROGRAM

MARYLAND DEPARTMENT OF NATURAL RESOURCES

TIDEWATER ADMINISTRATION

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FOREWORD

The Maryland Department of Natural Resources (DNR) Power Plant Research Program (PPRP) is required by Maryland law to review and evaluate the potential impacts to Maryland's environment from the construction and operation of electric power generating and transmission systems. PPRP summarizes these evaluations every other year in a document known as the Cumulative Environmental Impact Report (CEIR).

This CEIR consists of two volumes — a summary volume and a detailed review volume (Volume 2) which contains all source information and references used to produce the summary volume. Together, these reports, which represent the ninth CEIR (CEIR-9), describe the current state of knowledge regarding power plant impacts in Maryland.

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Section 1

1.0 BACKGROUND ON ELECTRIC POWER GENERATION IN MARYLAND

1.1 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 wastewater 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.

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). 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 CPCN process and the status of recent licensing proceedings are discussed in Section 2.

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.

1.2 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. 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. Section 1.4 discusses "power pools" in more detail.

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.

1.2.1 *Investor-owned Utilities (IOUs)*

Seven 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 and Light Company (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.

Figure 1-1
Utility Service Areas in Maryland

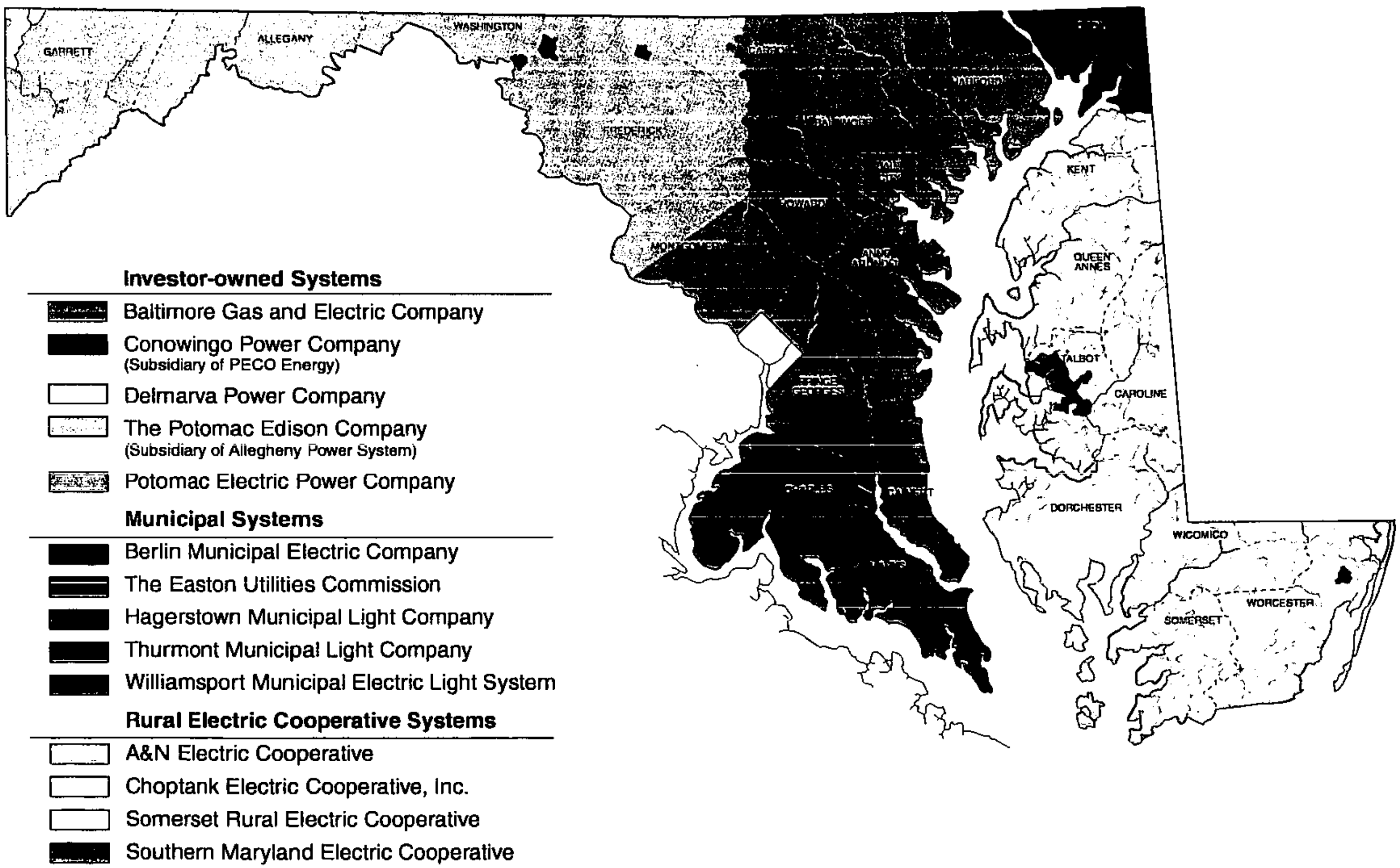
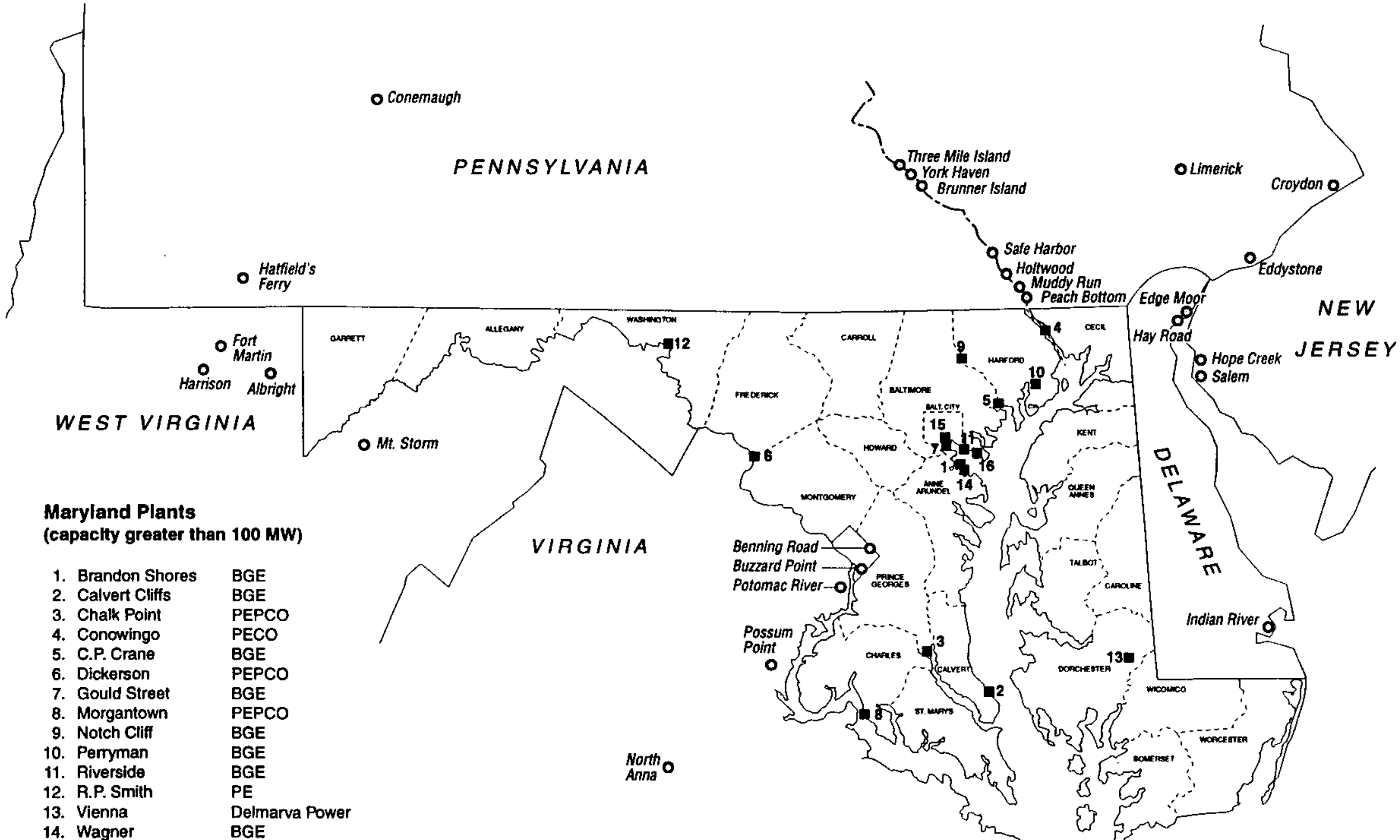


Figure 1-2
Location of Power Plants In and Around Maryland



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

1.2.1.1 *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 2,500,000 and more than 550,000 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, 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.

1.2.1.2 *Delmarva Power Company*

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 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.

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.

1.2.1.3 *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.

1.2.1.4 *Potomac Electric Power Company*

PEPCO provides service in the metropolitan Washington, D.C. area 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.

1.2.2 ***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 and is fully supplied by PEPCO; 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.

1.2.3 *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. See Section 1.2.3.1 for additional information on QFs.
- **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.

1.2.3.1 *Nationwide Trends*

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

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.

new capacity and they have heightened competition in bulk power markets.

Prior to the 1980s, NUGs were primarily self-generation facilities erected by industrial plants to ensure reliable service and trim power costs, not to compete directly with utility projects or other private suppliers. In Maryland, the power generation facilities at Bethlehem Steel, Amstar, and Westvaco are good examples of traditional industrial self-generation. Those facilities were installed several decades ago.

The federal **Public Utility Regulatory Policies Act** (PURPA) of 1978 and the Federal Energy Regulatory Commission (FERC) rulemaking in 1980 implementing PURPA altered this traditional arrangement. This legislation pulled down the barriers to NUG development, facilitating competition in bulk power supply. NUG facilities meeting certain technical and legal requirements under the FERC rules are granted **qualifying facility** (QF) status, which entitles them to certain privileges. A QF has a "guaranteed market" for all power it produces and supplies to the local utility, at rates reflecting the purchasing utility's "full avoided cost." This means that the local utility must purchase all power supplied to it by a QF and pay the QF rates reflecting the additional costs the utility would have incurred but for the purchase. This mechanism is designed to 1) eliminate barriers to QF development, 2) protect consumers against unnecessary cost increases, and 3) provide maximum economic encouragement to QFs short of providing financial subsidies.

The QF privileges granted under federal law have led to enormous increases in QF development in many parts of the country, particularly in New York, New England, California, Texas, Florida, and Pennsylvania. In some instances, utilities obtained too much capacity and incurred contract costs (due to overestimates of avoided cost) far in excess of market prices. Within the last two to four years, this has led to a reduction in utility contracting for new QF supplies. Moreover, a number of utilities experiencing severe excess capacity have expended large sums on cancellation fees to buy out QF power supply contracts, particularly for new projects not yet constructed.

While QF and NUG activity for new power supplies appears to be slowing, it remains an important source of new generating capacity nationwide. The North American Electric Reliability Council (NERC) reports that NUGs represent 4.2% of installed capacity in 1994, and by the year 2000 are projected to be 5.6%. Over the next ten years, nationwide, NUGs are expected to account for 18% of the *increase* in installed capacity.

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.

As competition in bulk power markets sharpens, the distinctions between QFs and IPPs (which do not share QF privileges) are becoming less important. This is because utilities, when they do acquire new capacity, tend to do so through competitive solicitations, with price a key factor in determining contract awards. This means that QFs must actively compete on a price basis with other entities including IPPs, utility "self-build" options, and other utilities with long-term excess capacity for sale. In the context of a competitive bidding environment, the "must buy" legal requirement for QFs is not meaningful, and "avoided cost" becomes the market price.

1.2.3.2 NUGs as a Source of Supply for Maryland

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. All others are very small and produce only modest amounts of energy. The only major QF project constructed in Maryland since 1978 is the BRESCO facility.

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

Facility	Location	Purchasing Utility	Type of Facility	Size (MW)	Projected On-line
Current					
BRESCO	Baltimore City	BGE	Waste	57	Current
Bethlehem Steel	Baltimore County	BGE	Cogenerator	169	Current
Westvaco	Allegany County	Self/PE	Waste	50	Current
Amstar	Baltimore County	Self/BGE	Cogenerator	10	Current
			Subtotal Current	286 MW	

This situation is changing, but not dramatically. There are several NUG projects in the planning stage 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 through 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 have been approved by the Maryland PSC.

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 a NUG facility to be built in Maryland will undergo the same comprehensive environmental review that utility-built power plants undergo during the licensing process (see Section 2.2).

In addition to the projects outlined in Table 1-2, several other NUG projects have been proposed either by utilities or NUGs themselves, but were subsequently rejected by the Maryland PSC. NUG projects sometimes fail to develop for a variety of other technical or economic reasons. Three recent NUG projects were rejected either because they failed the "avoided cost" test or because it was determined that there was not enough need for the additional capacity. At this time, it is difficult to predict how much of the NUG capacity under contract or planned will actually emerge.