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## ***Introduction***



The Maryland Department of Natural Resources (DNR) Power Plant Research Program (PPRP) evaluates how the design, construction, and operation of power plants and transmission lines impact Maryland's environmental, economic, and cultural resources. PPRP's legislative mandate calls for the program to explore and clarify these issues, seeking to ensure that the citizens of Maryland can continue to enjoy reliable electricity supplies at a reasonable cost while minimizing impacts to Maryland's natural resources. The program also plays a key role in the licensing process for power plants and transmission lines by coordinating the State agencies' review of new or modified facilities and developing recommendations for license conditions.

PPRP is authorized by the Maryland Power Plant Research Act (§3-304 of the Natural Resources Article of the Annotated Code of Maryland) to prepare a Cumulative Environmental Impact Report (CEIR) each biennium. The intent of the CEIR is to assemble and summarize information regarding the impacts of electric power generation and transmission on Maryland's natural resources, cultural foundation, and economic situation.

This report is the fourteenth CEIR (CEIR-14) published by PPRP, and like previous reports, is subdivided into chapters that provide analysis of resource impacts and topical discussions of current trends. Chapter 2 reviews power generation, transmission, and usage. Chapter 3 discusses sustainable and renewable energy resources. Chapter 4 completes the CEIR with discussions of the issues and effects of power generation and transmission on air, water, and land.

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## ***Legislative Mandate***

The Maryland legislature passed the Power Plant Siting Act in 1971 as a result of extensive public debate regarding the potential effects on the Chesapeake Bay from the Calvert Cliffs Nuclear Power Plant and concerns that the State be able to play a significant role in the decision-making process. Calvert Cliffs Units 1 and 2 were a source of concern because the plant uses a once-through cooling system that withdraws 3.5 billion gallons of water per day from the Bay and then discharges it back into the Bay with an increase in temperature of roughly 12°F. This and other issues prompted the creation of PPRP to ensure a comprehensive, objective evaluation, based on sound science, to resolve environmental and economic issues before decisions were made regarding whether and where to build additional power generating facilities.

Today, PPRP continues this role by coordinating the comprehensive review of proposed power generation and transmission facilities and by developing technically based licensing recommendations. Consistent with the original statute, PPRP also conducts research on power plant impacts to Maryland's natural resources, including the Chesapeake Bay. In addition to surface water concerns, PPRP evaluates impacts to Maryland's ground water, air, land, and socioeconomics for all proposed power facilities, including new plants, upgrades or expansions of existing plants, and new or modified transmission lines.



## *Power Plant Licensing*

The Maryland Public Service Commission (PSC) regulates power plants and transmission lines. The PSC is an independent commission created by the legislature with commissioners appointed by the Governor for set terms.

An entity planning to construct a generating facility or a transmission line — or modify an existing facility or transmission line — must receive a Certificate of Public Convenience and Necessity (CPCN) from the PSC before beginning construction. Applications for a CPCN are reviewed before a Hearing Examiner in a formal adjudicatory process that includes written and oral testimony, cross examination, and the opportunity for full public participation. The CPCN constitutes permission to construct the facility and incorporates several required permits, including air quality and water appropriation (see table in Appendix A). The broad authority of the PSC allows for the comprehensive review of all pertinent issues and was designed in 1971 to be a “one-stop shop” for power plant licensing.

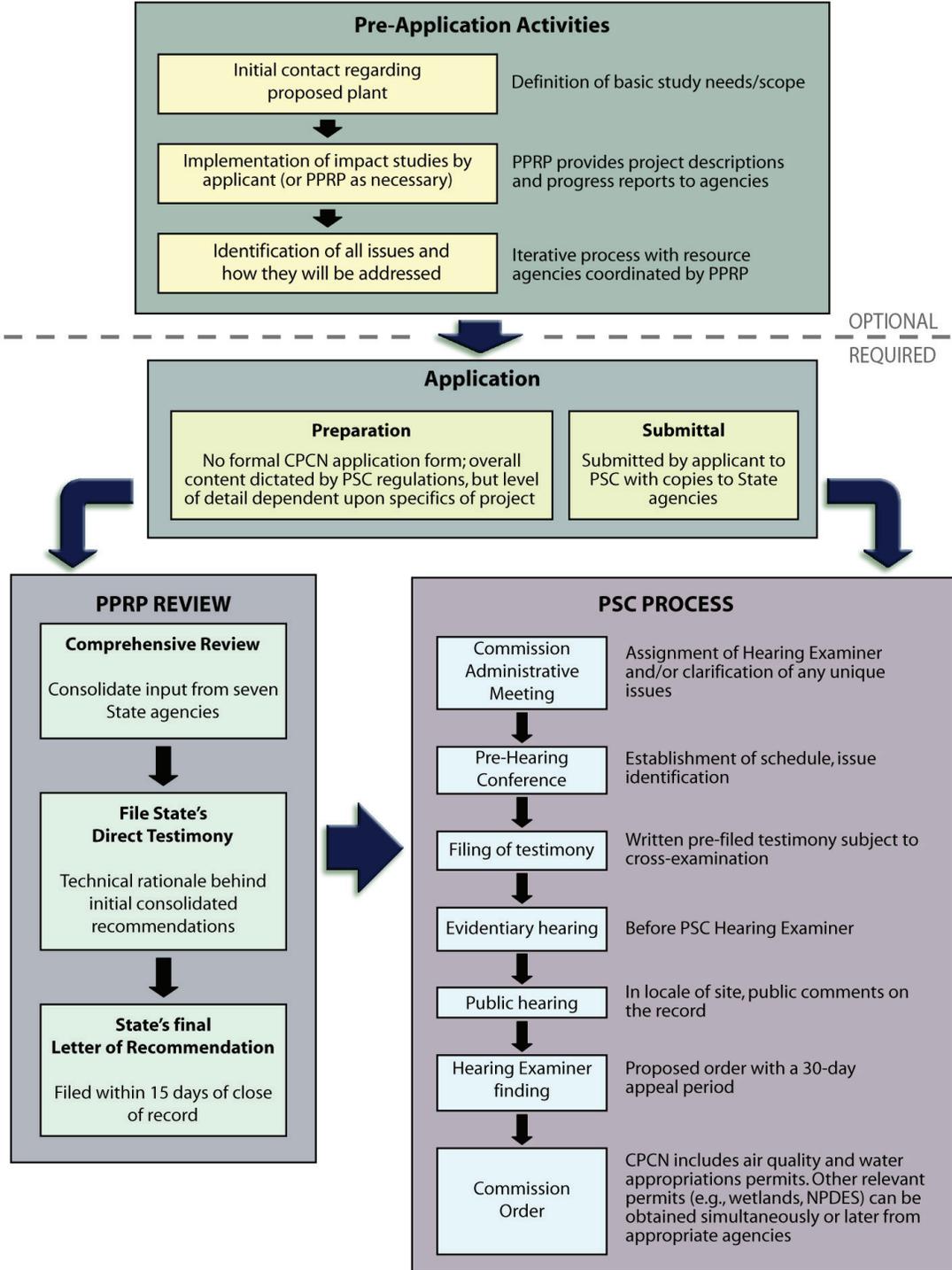
The CPCN licensing process provides an opportunity for the State to examine all the significant aspects and impacts of a proposed power facility, including the interrelations between various impacts and cumulative effects. This is a unique process within the State’s regulatory framework. The CPCN mechanism recognizes the fact that electricity is a vital public need, while its generation and transport can potentially impact natural and cultural resources. A distinguishing feature of CPCN licensing is the high degree of interagency coordination involved. The State’s consolidated review of a proposed power facility culminates in a set of licensing conditions, developed by PPRP in concert with the Departments of Natural Resources, Environment, Agriculture, Business and Economic Development, Planning, and Transportation, and the Maryland Energy Administration. In many instances, these conditions go beyond regulatory requirements to incorporate creative measures for mitigating potential facility impacts, often as stipulations agreed to by the applicant and other parties. PPRP coordinates the development of a consolidated set of recommended conditions and presents the conditions, along with supporting analysis, to the PSC on behalf of the State agencies.

If multiple facilities are located in close proximity, or are proposed in close proximity to each other or to existing plants, PPRP includes cumulative impacts within the consolidated review process. In such a case, impacts to air, water, terrestrial, land use, and other resources would be evaluated and compared to any identified thresholds of acceptability. Additionally, the cumulative analysis would identify any additional licensing conditions needed to address cumulative impacts due to multiple plant applications.

Figure 1-1 illustrates the elements of the CPCN licensing process, described in more detail below.

***Pre-application and Application.*** Although there is no formal pre-application procedure, when a company considers developing a new generation facility or transmission line, PPRP always encourages the prospective applicant to meet with Program staff to identify potential issues of concern and to determine whether and how all relevant concerns will be addressed. This also ensures that the applicant understands the PSC regulations and procedures. Once the applicant has decided to submit an application, PPRP prepares a project description

**Figure 1-1**  
**The CPCN Licensing Process**



and summary of key issues to inform the other State agencies and the public at large. By the time the applicant files for a CPCN, there usually has been a significant amount of dialogue and, often, the applicant has established that it is likely the proposed facility can obtain a CPCN, pending the development of recommended conditions. Through a diligent and thorough pre-application process, a prospective developer can limit the risk of submitting an unsuccessful CPCN application, or make changes during the preliminary design to minimize certain impacts.

***PSC Process and PPRP Review.*** At a preliminary administrative meeting, the PSC typically identifies a Hearing Examiner. Then, at a pre-hearing conference, the Hearing Examiner establishes an overall procedural schedule, including a discovery phase. The adjudicatory process commences with filing of direct testimony from the applicant, summarizing the impact analyses that have been done and providing the basis for the applicant's request for a CPCN. PPRP and any other parties that have intervened in the process may cross examine this testimony and present their own analyses in direct testimony. PPRP's testimony, presented on behalf of the various State agencies, typically includes initial recommended licensing conditions along with justifying analyses. This testimony is subject to vigorous cross examination by all parties. Other intervening parties, including the PSC Staff, Office of People's Counsel (a State agency charged with protecting the interests of electricity ratepayers), and citizens' groups, can prepare direct testimony and present their opinions and arguments in turn. This testimony is also subject to cross examination. The PSC holds an informational hearing to accept comments from the general public as well.

The Hearing Examiner takes into consideration the recommended license conditions, testimony, and briefs filed by the State, the applicant, and any other parties, and issues a decision in the form of a proposed order on whether the CPCN should be granted and under what conditions. After a period during which an appeal can be made to the full Commission, a final order is released granting or denying the application.

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## ***CEIR-14 Highlights***

This CEIR provides a comprehensive overview of issues related to power plants in Maryland. Some of these topics have been under review for decades, though the scientific understanding continues to progress. Other areas have gained prominence more recently in response to new advances in technology, economic or policy changes, and power industry restructuring. Highlighted below are a few issues that are discussed in more detail within this report.

***Update on Possible Expansion of Nuclear Power Generation Capacity.*** Nuclear power generation provides abundant and reliable energy. Because nuclear power plants do not burn fossil fuels (oil, natural gas, coal) to generate electricity, they are relatively free of harmful air emissions. As part of the 2005 Energy Policy Act, the U.S. Congress created substantial financial incentives for new nuclear power development, and renewed interest in the technology is growing. The existing Calvert Cliffs Nuclear Power Plant in Calvert County is one site being considered for construction of new nuclear generating capacity. [More information on page 13]

***Investments in New Transmission Infrastructure.*** Due to significant electrical load growth within Maryland and the region in general, electric utilities have indicated that the transmission and distribution system is in need of reinforcement to maintain reliable service to customers. After being relatively dormant for several years, transmission line licensing activity picked up in 2005, and electric companies are expected to seek permits for major new lines in the coming years. Transmission line projects can involve potential ecological impacts associated with linear facilities crossing streams and wetlands, as well as potential impacts to cultural resources. [More information on page 29]

***Sustainable Energy Resources.*** The use of renewable resources such as biomass, solar, wind, and hydroelectric energy continues to expand in Maryland. These types of generating technologies are generally cleaner than conventional power plants that burn fossil fuels, and can diversify Maryland's fuel mix. Each has its own set of potential drawbacks, whether related to environmental impact, cost, or other factors, and proposals must be carefully evaluated as with any new generating facility. The contribution of renewable energy sources to Maryland's overall generation mix is quite small; however, the State has passed legislation that would require electricity suppliers in Maryland to obtain an increasing percentage of their power from renewables. [More information on page 35]

***Maryland Healthy Air Act.*** The Maryland Healthy Air Act (HAA) was signed into law on April 6, 2006, and requires substantial reductions in emissions of NO<sub>x</sub>, SO<sub>2</sub>, and mercury from coal-fired generating units. The HAA also requires Maryland to participate in a multi-state program known as the Regional Greenhouse Gas Initiative (RGGI) to reduce emissions of pollutants, including CO<sub>2</sub>, that contribute to climate change. Emissions reductions will take place in two phases; the first will begin in 2009/2010, and the second will begin in 2012/2013, depending on the pollutant. [More information on page 64]

1971

**1971**

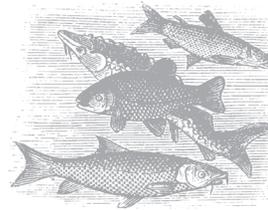
Power Plant Siting Act was passed by the Maryland legislature in 1971 to address potential effects on the Chesapeake Bay from the Calvert Cliffs Nuclear Power Plant. PPRP was created to ensure a comprehensive, objective evaluation, based on sound science, to resolve environmental and economic issues associated with building additional power generating facilities.



1975

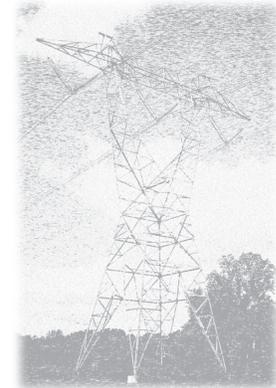
**1975**

Aquatic impacts of power plants are identified due to entraining fish eggs, larvae, and/or prey organisms into their cooling systems, impinging adult and juvenile fish and crabs on intake screens, and discharging heat and chemicals into receiving waters. PPRP began testing intake designs that discourage fish congregation and determined in 1988 that impingement and entrainment can be reduced to acceptable levels, not adversely affecting aquatic biota in Maryland's surface water bodies. PPRP later evaluated methods such as barrier nets and wedge-wire screens that have become widely used for reducing impingement and entrainment levels at power plants.



**1975**

PPRP established its radioecology laboratory and initiated radiological assessment of Calvert Cliffs Nuclear Power Plant. In the aftermath of the Three Mile Island accident in 1979, the Nuclear Regulatory Commission requested PPRP's assistance in evaluating impacts to human health and the environment from radioactivity released during the event and its cleanup. The ongoing monitoring program expanded to cover Peach Bottom Atomic Power Station in Pennsylvania, just upstream from Conowingo on the Susquehanna River, in 1981. Over the past 30 years, the radioecology program has developed a valuable long-term database of radionuclide fate and transport throughout the Bay ecosystem.



1980

# Sample of PPRP Technical Issues 1971-2006

**1978**

Clean Air Act Amendments of 1977 included provisions for the Prevention of Significant Deterioration (PSD) and non-attainment areas. PPRP recommended forming a policy board, establishing an offset bank exchange, and creating a multi-state planning council to share information and resolve disputes between states. On an ongoing basis, continuing with the Clean Air Act Amendments of 1990 and Maryland's Healthy Air Act of 2006, PPRP has analyzed compliance alternatives for the state's power plants and helped provide State agencies and lawmakers with technical background to support policy decisions.



**1982**

Coal-fired power plant operations create large quantities of solid combustion products, primarily fly ash, which need to be managed. While reuse is desired, some quantity of waste must be landfilled. PPRP conducted the first survey of coal combustion product (CCP) management methods in use across the state, a landmark first step in developing a thorough technical basis for evaluating, minimizing, and mitigating potential adverse impacts.

1985

1990

**1984**

Sulfur and nitrogen emissions generated by power plants were identified as a large contributor to the formation of acid rain in the Northeast and Maryland: PPRP funded significant research to determine the extent of the problem and to identify remedial actions.



**1985**

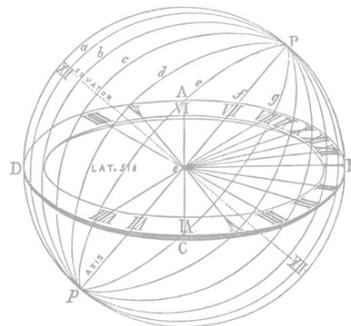
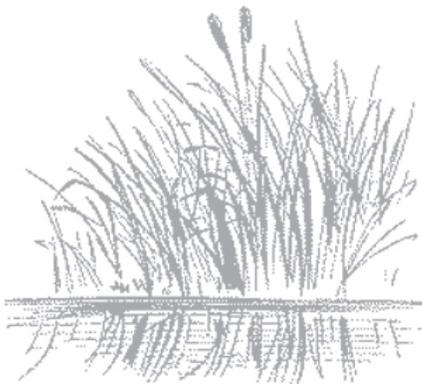
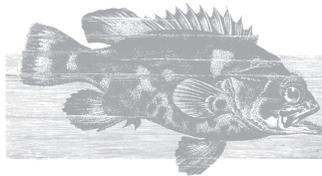
Aquatic impacts such as denied access of anadromous fish to upstream spawning areas are observed at main stem Susquehanna hydroelectric dams. As the State lead, PPRP worked with Pennsylvania agencies, federal agencies, and private intervenors to address both fish passage and water quality in the federal relicensing of Conowingo and other dams on the Susquehanna. The first fish passage facility on the Susquehanna began operating in 1985. Over the subsequent 15 years, an additional stretch of more than 400 miles of the river is now open to migratory fish as a result of these settlement agreements.

**1992**

As an outcome of PPRP's evaluation of aquatic impacts from large-volume water withdrawals at all of Maryland's power plants, BGE and PEPCO were required to conduct additional studies on long-term impacts at Calvert Cliffs, Chalk Point, Dickerson, and Wagner. In addition, PEPCO established a fish hatchery operation on the Patuxent River estuary. From 1992 to 1997, the hatchery produced 3.5 million juvenile striped bass and 750,000 shad to mitigate losses caused by the power plant's intake of cooling water. PEPCO also provided the State with \$100,000 per year for five years to fund environmental education and support projects to remove passage obstructions for anadromous fish.

**1993**

The effects of electromagnetic fields (EMFs) associated with generating, transmitting, distributing, and using electric power were evaluated and studies reveal conflicting results. PPRP reviewed all EMF studies and provided annual summary reports to the PSC on significant findings. Utilities constructing transmission lines have agreed to protocols for EMF measurements as well as utilization of conductor configurations resulting in the lowest EMF field strengths.



1995

2000

2005

**1996**

PPRP joined the Maryland Geological Survey and the U.S. Geological Survey in operating ground water monitoring programs to track water levels in affected aquifers over time, in response to increasing public awareness of ground water withdrawal by Maryland power plants from several coastal aquifers.

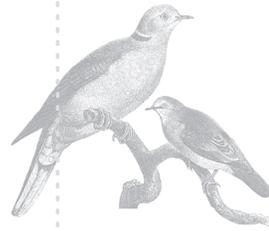


**2003**

The interest in alternative energy sources, especially wind and solar power, remained on the rise and numerous green power incentives emerged. Two windpower developers, Clipper and US WindForce, proposed developments in western Maryland, and PPRP expedited the review process by helping to broker settlements between all the parties. Through the CPCN process, both developers agreed to provide significant support for field studies addressing the paucity of information available on bird population dynamics in the vicinity of their two sites.

**1999**

In response to water quality concerns in Maryland streams, apparently linked to agricultural runoff and the overuse of poultry litter as fertilizer, PPRP evaluated the suitability of using poultry litter as fuel. Three alternative technologies were identified that could accommodate the use of litter as a fuel: direct combustion, fluidized bed combustion, and gasification.



**1997**

As part of the CPCN licensing process, Panda Energy agreed to use treated effluent from the Mattawoman Wastewater Treatment Facility as a source of 1.5 million gallons per day of cooling water at its combined cycle plant in Brandywine. This approach, the first use of treated effluent for power plant cooling water in the state, conserves groundwater sources in Southern Maryland, and has helped generate operational data for other Maryland power plant proposals. Other proposed plants where use of treated effluent is possible in the future include Perryman (if a future steam cycle is constructed) in Harford County, CPV in Charles County, and scrubber makeup water at Brandon Shores and Morgantown.

**2006**

Maryland passed the Healthy Air Act, a comprehensive regulatory program to reduce emissions and improve air quality in the state and the region. During 2006-07, PPRP engaged in expedited licensing projects that involved substantial emission control projects at most of Maryland's coal-fired plants.

**2000**

The Maryland legislature introduced electricity competition. PPRP studied the potential environmental and economic impacts of restructuring and, over the next few years, observed that low utility rate freezes were limiting the development of a competitive retail market in Maryland.

**2001**

Through the CPCN licensing review process, Old Dominion Electric Cooperative agreed to support stream buffer restoration efforts, mitigating the effects of nitrogen deposition from the proposed Rock Springs power plant.

