ICPRB Comprehensive Water Resources Plan Advisory Committee

March 2, 2017 Meeting

Susan Gray
Power Plant Research Program
• Set the stage - briefly describe how Maryland gets its electricity
• Step through time – what events shaped how power plants are sited and permitted today in Maryland
• Recent PPRP work - including the 18th edition of the Cumulative Environmental Impact Report (CEIR-18)
Maryland is a net importer of electricity. We consume more than we generate.

Maryland imports electricity from PJM.
- Independent, federally regulated organization; **operates the grid**
- Balances electric supply & demand through **reliable transmission**
- Does **not** direct construction of new **generation**
- Tells generators when to send electricity to the grid based on the electricity prices bid-in by the generators
• Plants **least expensive** to run operate almost continuously in order to meet minimum electric demand (base-load plants: coal, nuclear, some natural gas)

• Plants **more expensive** to run with the ability to quickly send electricity onto the grid to meet peak demand (natural gas, oil, hydro)

• PJM also uses Demand Response

**Resource: PPRP Electricity Fact Book**
• Set the stage - briefly provide facts and figures on Maryland’s power industry
• Step through time – what events shaped how power plants are sited and permitted today in Maryland
Concerns over the ability of the State to provide significant technical review of the impacts of the proposed Calvert Cliffs Facility resulted in the Passage of The Power Plant Siting Act of 1971.
Reprinted from Laws of Maryland 1971

CHAPTER 31
(Senate Bill 540)

AN ACT to add new Sections 768 through 768, inclusive, to Article 26C of the Annotated Code of Maryland, title "Natural Resources," subtitle "In General," subheading "Department of Natural Resources," to follow immediately after Section 767 thereof, and to be under the new subtitle "Power Plant Siting," to establish an Environmental Trust Fund from a surcharge on generated kilowatts of electricity energy to be used to underwrite power plant environmental research and site evaluation program and to ensure long-range and timely planning for power plant sited selection and acquisition, to strengthen the State of Maryland's capability to define and manage a power plant environmental research program, to provide for the execution of eminent domain and potential power plant site ownership by the Secretary of Natural Resources, and to exempt from local zoning certain sites; to add new Section 54 to Article 26C of the Annotated Code of Maryland, title "Natural Resources," subtitle "In General," subheading "Department of Natural Resources," to assign responsibility to the Secretary of Natural Resources on applications to the Public Service Commission for certificates of public convenience and necessity associated with power plant construction; to repeal and re-enact Section 502 of Article 48 of the Annotated Code of Maryland, title "Natural Resources," subtitle "In General," subheading "Department of Natural Resources," to define "In General," and to make other related and necessary changes.

EXPLANATION: [Brackets] indicate matter stricken from resolution. [Brackets] indicate matter stricken from existing law. CAPITALS indicate amendments to bill. Strike out indicates matter stricken out of bill.

For the CPCN, PPRP:

- Conducts a comprehensive, objective assessments based on sound science of electrical generation and transmission lines
- Coordinates a consolidated State Agency review process
1999: Deregulation

- Maryland General Assembly passed legislation – **Electric Customer Choice and Competition Act of 1999**
  - Many other (but not all) states deregulated.
- **Goal:**
  - provide consumers with the **lowest possible prices** for electricity
  - allow **customers to choose** their power supplier
  - provide incentives for the creation and development of **innovative products and services**.
Before 1999

- **Vertically integrated electric utilities**
  - *Regulated monopolies* responsible for generation, transmission & distribution services
  - *Rates set by the PSC* to recover reasonable costs and earn a fair return on investment
  - Utilities looked at alternative sites for generation and transmission as part of their **integrated planning process**.

- **Competitive firms** prohibited from marketing and selling generation service within the franchised service area of the utility
After 1999

- Divestiture of Maryland’s utility power plants
- Relieved the utilities of their integrated planning function
  - The market determines the type, size, and location of new generation
- Made retail generation competitive; so the PSC
  - Doesn’t regulate the cost of electricity generated by plants located in Maryland
  - Is responsible for setting rates for electric distribution
  - Approves new/modified electric generating plants and transmission lines via the CPCN process
Presentation Purpose

• Step through time – what events shaped how power plants are sited and permitted today in Maryland

• Recent PPRP work, including the 18th edition of the Cumulative Environmental Impact Report (CEIR-18)
What is CEIR-18?

• PPRP assembles and summarizes information regarding the cumulative impacts of electric power generation and transmission on Maryland’s environmental, socioeconomic, and cultural resources into CEIR-18.

• Link to web-based report available at: http://pprp.info/
A Snapshot of Today’s
Maryland Electric Infrastructure

- Over 2000 miles of Transmission Lines
- Planned upgrades of existing lines, but no new backbone TLs.
- Over 50 Utility Scale Power Plants (greater than 2MW)
- At Least 1 Utility Scale Plant in 17 out of 24 Counties/Balt.City
Total In State Generation Capacity ~ 13,500 MW
  • Fossil Fuel ~ 10,800 MW
    • Coal ~ 5,100 MW
    • Petroleum ~ 3,300 MW
    • Natural Gas ~ 2,400 MW
  • Nuclear ~ 1,800 MW
  • Renewables ~ 900 MW

Rule of Thumb: 1MW of electricity will supply ~ 1000 homes
... Caution: capacity doesn’t equal output to the grid.
Steam power plants using once-through cooling:

- **Dickerson** (150 mgd withdrawal; ~0.6 mgd consumption)
- **Morgantown** (1,195 mgd withdrawal; ~2.3 mgd consumption)

Steam power plants using closed-cycle cooling:

- **Montgomery County Resource Recovery Facility** (~0.4 mgd consumption, average of 2013-14)
- **AES Warrior Run** and **Brandywine** also use closed-cycle cooling but obtain their water from the City of Cumberland and Mattawoman WWTP.
<table>
<thead>
<tr>
<th>Power Plants</th>
<th>2012</th>
<th>2013</th>
<th>2014</th>
<th>2015</th>
</tr>
</thead>
<tbody>
<tr>
<td>AES Warrior Run Cogeneration Facility (coal-fired)</td>
<td>1,314,894</td>
<td>1,349,562</td>
<td>1,265,667</td>
<td>1,165,822</td>
</tr>
<tr>
<td>Brandywine Power Facility (gas-fired)</td>
<td>676,556</td>
<td>931,181</td>
<td>955,013</td>
<td>1,294,284</td>
</tr>
<tr>
<td>Dickerson (coal-fired)</td>
<td>1,182,307</td>
<td>1,045,748</td>
<td>1,266,927</td>
<td>867,959</td>
</tr>
<tr>
<td>Morgantown Generating Plant (coal-fired)</td>
<td>5,224,277</td>
<td>3,911,291</td>
<td>6,181,301</td>
<td>4,244,594</td>
</tr>
</tbody>
</table>

Changes due to low natural-gas prices, etc.
Surface Water Use Trends

Figure X  Total Annual Surface Water Use at Maryland Power Plants

Year

Total Annual Volume (millions of gallons)

- Dickerson
- MO Co Resource Recovery
- Morgantown
Use of Effluent from Waste Water Treatment Plants (WWTPs)
• Brandywine (currently in use)
• CPV Maryland (commercial operation - 2017)
• Mattawoman Energy Center (construction of reclaimed water pipeline underway)

Dry Cooling
• Keys Energy Center (commercial operation - 2017)

The Future?

“It’s tough to make predictions, especially about the future.”
– Yogi Berra
Potential Future
Generation

• No new steam generation units in the PJM queue at this time
• Any future steam generating units would have to evaluate use of reclaimed water and/or dry cooling

A final thought.....
Generation “Tradeoffs”

Every type of generation has its pros and cons.
Generation Air & Water Use Comparisons

- **Water Use (gal/MWh)**
  - (Operations Only)

- **Air Emissions (g CO2e/kWh)**
  - (Lifecycle Cost Assessment)

The bar chart compares water use and air emissions across different energy sources:

- **Coal**
- **Natural Gas**
- **Nuclear**
- **Wind**
- **Solar**
**Generation Land Use Comparisons**

- **0.6 Acres/MW**
  - 13,140 MWh/Acre

- **1 Acre/MW**
  - 7,446 MWh/Acre

- **2 Acres/MW**
  - 2,190 MWh/Acre

- **5 Acres/MW**
  - 263 MWh/Acre
  - (minimum)
  - 526 MWh/Acre
Thank You!