

ICPRB Comprehensive Water Resources Plan Advisory Committee

March 2, 2017 Meeting

Susan Gray
Power Plant Research Program

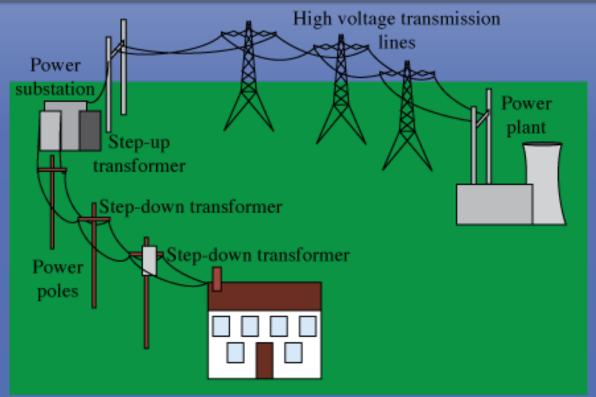
Presentation Purpose



- 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)

Electric Service





- Generation
- Transmission
- Distribution
- Behind the Meter

Maryland is a net importer of electricity. We consume more than we generate.

Maryland imports electricity from PJM.

PJM Interconnection



- Independent, federally regulated organization; operates the grid
- Balances electric supply & demand through <u>reliable</u> <u>transmission</u>
- Does <u>not</u> direct construction of new <u>generation</u>
- Tells generators when to send electricity to the grid based on the electricity prices bid-in by the generators

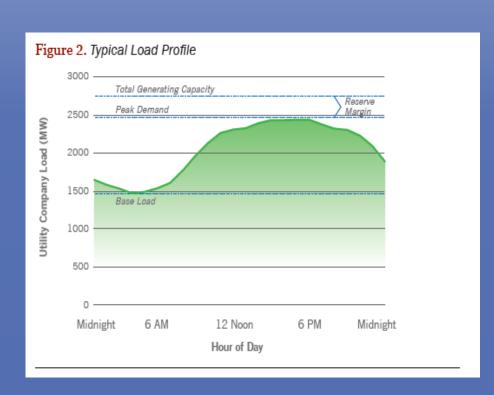
PJM is our RTO



PJM Power Plant Dispatch



- Plants <u>least expensive</u> to run operate almost continuously in order to meet minimum electric demand (<u>base-load</u> <u>plants</u>: 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

Presentation Purpose



- 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

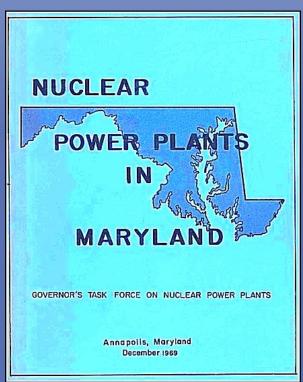
1971: The Power Plant Siting Act



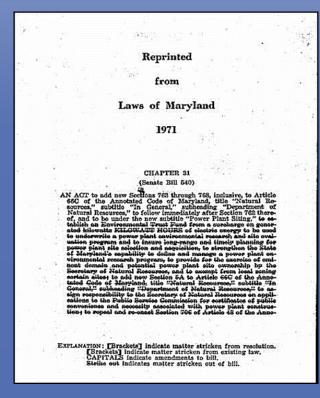


Concerns over the ability of the State to provide significant technical review of the impacts of the proposed Calvert Cliffs Facility

<u>resulted in</u>



Then Governor Mandel's 1969 Task Force Report on Power Plant Review



The Passage of The Power Plant Siting Act of 1971

Ultimately resulting in

Creation of PPRP



Reprinted

from

Laws of Maryland

1971

CHAPTER 31 (Senate Bill 540)

AN ACT to add new Sections 763 through 768, inclusive, to 66C of the Annotated Code of Maryland, title "Natt sources," subtitle "In General," subheading "Depart Natural Resources," to follow immediately after Section 762 diere of, and to be under the new subtitle "Power Plant Siting," be establish an Environmental Trust Fund from a suvelarge on generated kilowatts KILOWATT HOURS of electric energy to be used to underwrite a power plant environmental research and site evaluation program and to insure long range and timely planning for power plant site 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 exercise 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 now Section 5A to Article 66C of the Annotated Code of Maryland, title "Natural Resources," subtitle "In Concrel," subheading "Department of Natural Resources," subtitle "In Concrel," subheading "Department of Natural Resources," to assign responsibility to the Secretary of Natural Resources, applications to the Public Service Commission for certificates of public convenience and necessity associated with power plant centeruction; to remeal and the capability associated with power plant centeruc

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 <u>lowest possible prices</u> for electricity
 - allow <u>customers to choose</u> 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

- Power substation lines

 Step-up transformer

 Step-down transformer

 Power plant
- 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)

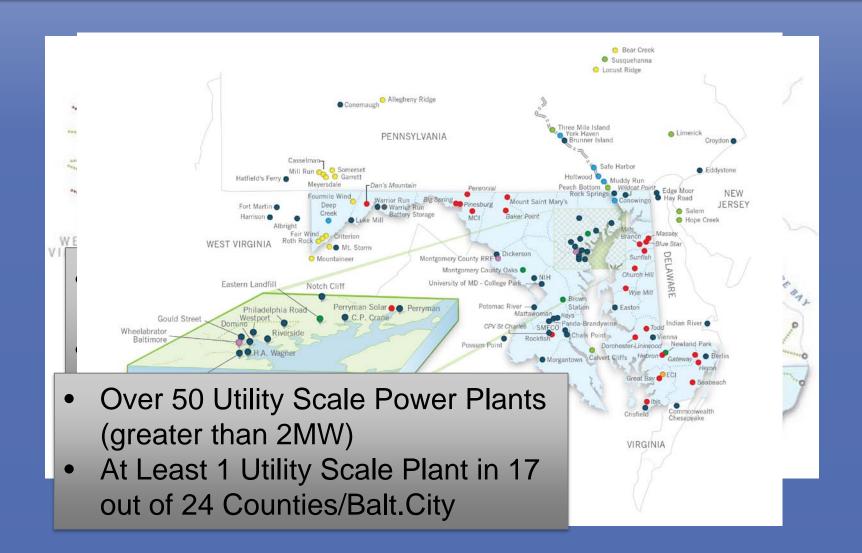
What is CEIR-18?



- 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



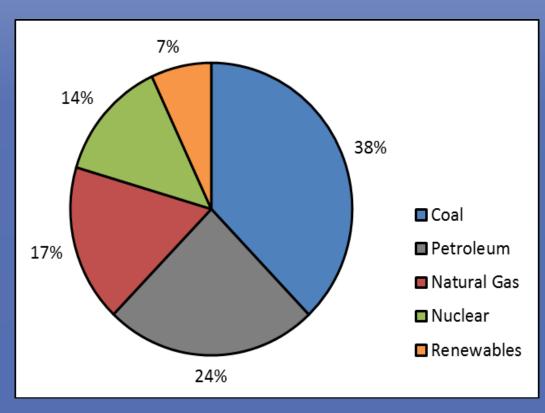


Power Plant Capacity in Maryland



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.

Power Plants in the Potomac Basin



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 closedcycle cooling but obtain their water from the City of Cumberland and Mattawoman WWTP.

16

Generation Trends



Annual Net Generation (MWh)

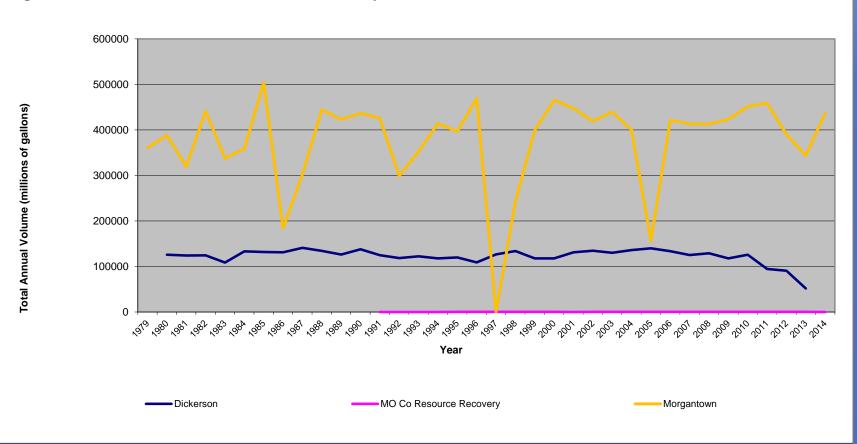
Power Plants	2012	2013	2014	2015
AES Warrior Run Cogeneration Facility (coal-fired)	1,314,894	1,349,562	1,265,667	1,165,822
Brandywine Power Facility (gas-fired)	676,556	931,181	955,013	1,294,284
Dickerson (coal-fired)	1,182,307	1,045,748	1,266,927	867,959
Montgomery Co. Resource Recovery	305,525	304,230	318,091	329,219
Morgantown Generating Plant (coal-fired)	5,224,277	3,911,291	6,181,301	4,244,594

Changes due to low natural-gas prices, etc.

Surface Water Use Trends







Cooling System Alternatives



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"



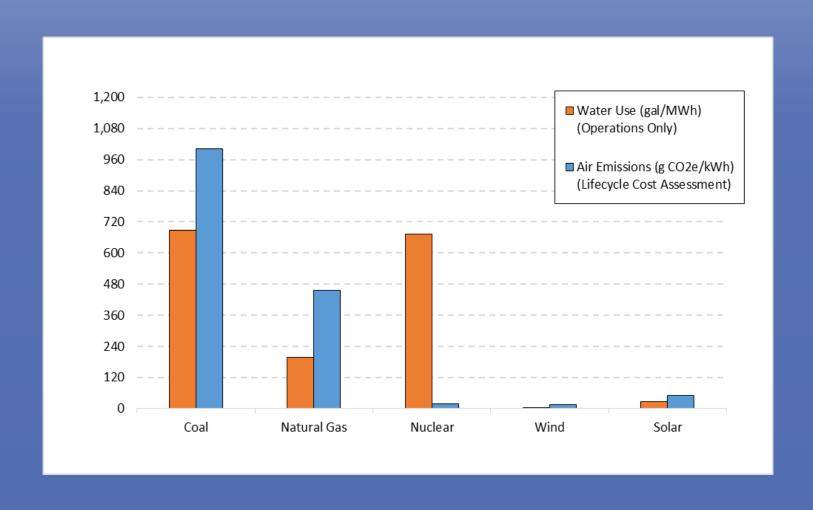
Every type of generation has its pros and cons.





Generation Air & Water Use Comparisons





Generation Land Use Comparisons





0.6 Acres/MW 13,140 MWh/Acre



2 Acres/MW 2,190 MWh/Acre



5 Acres/MW 263 MWh/Acre

1 Acre/MW 7,446 MWh/Acre



5 Acres/MW (minimum) 526 MWh/Acre



Thank You!



