Energy Storage, Renewables & What’s Coming

Maryland’s Electricity Portfolio: The Past, The Present and the Future

October 4, 2017
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Power Plant Research Program
Presentation Purpose

• Set the stage - some facts on MD’s electricity infrastructure – past and present
• Step through time – how Maryland’s electricity “past” has shaped how power plants are sited and permitted today
Presentation Purpose

• CPCN process - basic principles of how power plants are permitted in Maryland
• 2 new PPRP initiatives - Energy Storage Study and RPS Study
• What’s Next – a look at what we may see in Maryland’s electricity future
Electric Service

Maryland is a net importer of electricity.
### Total MD Electric Consumption and Generation 2006-2015

<table>
<thead>
<tr>
<th>Year</th>
<th>Retail Sales (Consumption)</th>
<th>Sales + T&amp;D Losses*</th>
<th>Generation</th>
<th>Net Imports</th>
<th>Percentage of Sales Imported Plus Losses*</th>
</tr>
</thead>
<tbody>
<tr>
<td>2006</td>
<td>63,173</td>
<td>66,964</td>
<td>48,957</td>
<td>18,007</td>
<td>27%</td>
</tr>
<tr>
<td>2007</td>
<td>65,391</td>
<td>69,314</td>
<td>50,198</td>
<td>19,116</td>
<td>28%</td>
</tr>
<tr>
<td>2008</td>
<td>63,326</td>
<td>67,125</td>
<td>47,361</td>
<td>19,764</td>
<td>29%</td>
</tr>
<tr>
<td>2009</td>
<td>62,589</td>
<td>66,344</td>
<td>43,775</td>
<td>22,570</td>
<td>34%</td>
</tr>
<tr>
<td>2010</td>
<td>65,335</td>
<td>69,256</td>
<td>43,607</td>
<td>25,648</td>
<td>37%</td>
</tr>
<tr>
<td>2011</td>
<td>63,600</td>
<td>67,416</td>
<td>41,818</td>
<td>25,598</td>
<td>38%</td>
</tr>
<tr>
<td>2012</td>
<td>61,814</td>
<td>65,522</td>
<td>37,810</td>
<td>27,713</td>
<td>42%</td>
</tr>
<tr>
<td>2013</td>
<td>61,899</td>
<td>65,613</td>
<td>35,851</td>
<td>29,763</td>
<td>45%</td>
</tr>
<tr>
<td>2014</td>
<td>61,684</td>
<td>65,385</td>
<td>37,834</td>
<td>27,551</td>
<td>42%</td>
</tr>
<tr>
<td>2015</td>
<td>61,709</td>
<td>65,412</td>
<td>36,390</td>
<td>29,022</td>
<td>44%</td>
</tr>
</tbody>
</table>

*Assumes transmission and distribution (T&D) losses of 6%.

Source: U.S. Energy Information Administration, *Retail Sales of Electricity, Annually.*

Units: thousands of MW-hrs
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
2015 Electric Generation by Fuel Type (USA, PJM, Maryland)

- **All Renewables:** 4% (2007)
- **Coal:** 59% (2007)
- **Nuclear:** 29% (2007)
- **Natural Gas:** 4% (2007)
Renewable Generation by Fuel Type (2015)

- Petroleum, 1,144 MW
- Solar, 299 MW
- Wind, 251 MW
- Natural Gas, 150 MW
- Biomass, 32 MW
Set the stage

Step through time – how Maryland’s electricity “past” has shaped how power plants are sited and permitted today
1910: Creation of the Maryland PSC

- Established by the General Assembly
- Independent agency within State government
- Many responsibilities including approval of Maryland electric generating plants and transmission lines through a process called the **CPCN** – Certificate of Public Convenience and Necessity
Concerns over the ability of the State to provide significant technical review of the impacts of the proposed Calvert Cliffs Facility resulted in the then Governor Mandel’s 1969 Task Force Report on Power Plant Review.

Creation of PPRP

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
7 Secretaries Letter, Recommended Licensing Conditions and ERD

The Honorable Glenn F. Ivey
Chairman
Public Service Commission
8 St. Paul Center
Baltimore, Maryland 21202

Re: Case No. 8838

Dear Chairman Ivey:

In accordance with Section 3-707 and 7-208 of the Public Service Commission Act of Maryland, the Office of Planning and the Department of Economic Development have reviewed the application for a license to operate the Brown Station Road Landfill in Prince George’s County.

As set forth more fully in the Environmental Review Document (ERD) issued by the Maryland Department of Environmental Protection, the facility will be constructed on the site of the former Brown Station Landfill. The ERD includes a detailed assessment of the environmental impacts of the proposed facility.

Based on our review of the ERD, we have concluded that the site is suitable for the proposed landfill. We recommend that the application for a license to operate the facility be approved.

Sincerely,

Henry W. Virtis
Department of Agriculture

Richard C. Mike Levin
Department of Business and Economic Development

Ronald Young
Office of Planning

John D. Porcaro
Department of Transportation

Frederick H. Hoover, Jr.
Maryland Energy Administration

Jane M. Clark
Department of the Environment

Dr. Sarah J. Taylor-Rogers, Ph. D.
Department of Natural Resources

Environmental Review Document (ERD)

Recommended Licensing Conditions

PSC Case No. 8838
Brown Station Road Landfill Generator

General Requirements

1. Except as otherwise provided for in the following provisions, the application for the Certificate of Public Convenience and necessity (CPCN) is to be considered by the Public Service Commission (PSC) on February 12, 2000. The construction and operation of the facility shall be undertaken in accordance with the CPCN application and subsequent amendments. If there are any inconsistencies between the certificate conditions specified below and the application, the conditions in this certificate shall take precedence. In the application, estimates of dimensions, volumes, emission rates, operating rates, fee rates and hours of operation are not deemed to constitute enforceable numeric limits except to the extent that they are necessary to make a determination of compliance with applicable regulations.

2. If any provision of this certificate shall be held invalid for any reason, the remaining provisions shall remain in full force and effect, and such invalid provision shall be considered severed and deleted from this certificate.

Air Quality Requirements

3. Representatives of the Maryland Department of the Environment, Air and Radiation Management Administration (ARMA) shall be afforded access to the Brown Station Landfill property at any reasonable time to conduct inspections and evaluations necessary to assure compliance with the certificate. The Permittee shall provide such assistance as may be necessary to effectively and safely conduct such inspections and evaluations by representatives of the Department, that may include but need not be limited to the following:

a) inspecting any material stored or processed on site, or any waste, or discharge into the environment;

b) inspecting any monitoring or recording equipment required by this certificate or

Applicable Regulations;
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**
  - 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
- 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 proposed type, size, and location of new generation
After 1999 (cont.)

- 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
Next...

- Step through time
- Basic principles of how plants are permitted in Maryland
What must a Generator do to construct and operate a Power Plant in MD?

- PJM - Interconnection Agreement
- County Permits
- Public Service Commission – CPCN
- Other State and Federal Permits

CPCN Exemptions

- Generation capacity ≤ to 2MW
- On-site generation capacity (up to 25 MW) and at least 10% is consumed on site
- On-site generation capacity (up to 70 MW) and at least 80% is consumed on site
- Land-based wind generation capacity (up to 70 MW)
What is the CPCN Process?

Adjudicatory Process
Parties to the Proceeding

- PPRP
- PSC Staff
- Applicant
- OPC
- Other Intervenors (e.g. Counties, Federal Gov., Members of the Public, Envr. Groups)
Before a CPCN Application is Filed

Pre-application “Smart’s” Applicant initial contact with:

County

PPRP & Other State Agencies

Other Interested Parties

Identify pertinent issues early on
CPCN Process
Summary Steps

Application (Generator > 2MW) → PSC Admin Mtg; Judge Assigned to Case → Prehearing Conference

→ Discovery (Data Requests) → Filing of Testimony and Supporting Documentation

→ Evidentiary and Public Hearings; Legal Briefs → PSC Proposed Order incl. Permit Conditions → Order Becomes Final in 30 Days Unless Appealed

Order Becomes Final in 30 Days Unless Appealed
Any party to the Proceeding Can Appeal

1. Utility Law Judge Proposed Order can be appealed to the full 5-Member PSC Commission

Anyone Can Appeal

1. 5-Member Commission order can be appealed to the Circuit Court

2. Circuit Court Order can be appealed to the Court of Special Appeals
Timeframe for Appeals: 6 to 24 months (Note: Without certain, additional legal actions, Developer can construct at its own risk once PSC issues its Final Order)
PSC can take final action on a CPCN application only after due consideration of:

- the recommendation of the governing body of the county or municipal corporation
- County’s comprehensive plan
- the effect of the generating station on:
  - stability & reliability of the grid
  - environmental & economics/socioeconomics impacts
  - safety (e.g., aviation safety)
New & Ongoing CPCN Projects

Power Plant Research Program

Projects Under Review

Quick Links
- Cumulative Environmental Impact Report Web Pages
- Cumulative Environmental Impact Report Summary
- Electricity Fact Book
- Long-Term Electricity Report
- Bibliography
Presentation Purpose

- CPCN process  - basic principles of how power plants are permitted in Maryland
- 2 new PPRP initiatives - Energy Storage Study and RPS Study
  - RPS Study (HB1414/SB1146)
  - Energy Storage Study (HB773)
Electricity suppliers demonstrate compliance with Maryland’s Renewable Portfolio Standard (RPS) by accumulating renewable energy credits (RECs) based on their retail sales.

Maryland RPS Requirements

% of Total Sales

- Total
- Tier 1
- Tier 2
- Solar
- Offshore Wind

*Does not include solar or offshore wind

Source: PPRP
Maryland’s RPS

Maryland RPS Compliance Credits and Costs

Source: EIA based on MD PSC
Other States with a RPS

WA: 15% x 2020
OR: 50% x 2040* (large utilities)
CA: 50% x 2030
NV: 25% x 2025
AZ: 15% x 2025
MT: 15% x 2015
UT: 20% x 2025
CO: 30% x 2020 (IOUs)
SD: 10% x 2015
KS: 20% x 2020
IA: 105 MW
MN: 26.5% x 2025 (IOUs) 31.5% x 2020 (Xcel)
WI: 10% x 2015
MI: 15% x 2021
ND: 10% x 2015
MO: 15% x 2021
OH: 12.5% x 2026
IL: 25% x 2026
IN: 10% x 2025
NC: 12.5% x 2021 (IOUs)
VA: 15% x 2025
SC: 2% x 2021
TX: 5,880 MW x 2015
HI: 100% x 2045
ND: 10% x 2015
NV: 25% x 2025
AZ: 15% x 2025
CA: 50% x 2030
OR: 50% x 2040* (large utilities)
WA: 15% x 2020
MT: 15% x 2015
UT: 20% x 2025
CO: 30% x 2020 (IOUs)
SD: 10% x 2015
KS: 20% x 2020
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MN: 26.5% x 2025 (IOUs) 31.5% x 2020 (Xcel)
WI: 10% x 2015
MI: 15% x 2021
ND: 10% x 2015
MO: 15% x 2021
OH: 12.5% x 2026
IL: 25% x 2026
IN: 10% x 2025
NC: 12.5% x 2021 (IOUs)
VA: 15% x 2025
KS: 20% x 2020
ME: 40% x 2017
NH: 24.8 x 2025
VT: 75% x 2032
MA: 15% x 2020 (new resources) 6.03% x 2016 (existing resources)
CT: 27% x 2020
RI: 38.5% x 2035
NJ: 20.38% RE x 2020 + 4.1% solar by 2027
PA: 18% x 2021
DE: 25% x 2026
MD: 25% x 2020
DC: 50% x 2032

Renewable portfolio standard
Renewable portfolio goal
RPS Policies as Drivers of Renewable Generation

- 60% of all growth in renewable energy (RE) generation since 2000 was required by RPS policies
- Additional drivers include: voluntary green power markets, accelerated RPS procurement, and economic purchases


Source: Lawrence Berkeley National Laboratory
“PPRP shall conduct a study of the RPS… The study shall be a comprehensive review of the history, implementation, overall costs and benefits and effectiveness of the RPS in relation to the energy policies of the state.”

Interim / Final Report due December 1, 2018 / 2019 to Governor, Senate Finance Committee, and House Economic Matters Committee
The role and effectiveness that the standard may have in reducing the carbon content of imported electricity and whether... complementary policies or programs could help address carbon emissions associated with electricity imported into the State.

In 2015, Maryland imported 44% of its electricity.
The net environmental and fiscal impacts that may be associated with long-term contracts (LTCs) tied to clean energy projects including... ratepayer impacts... and whether the use of LTCs incentivized new renewable energy generation development.

- In competitive states RECs are typically sold separately from electricity via spot-market transactions or short-term contracts
- Long-term contracting shifts some RECs into longer-term, bundled power purchase agreements

Source: LBNL
Subjects to be Addressed

Whether the State is able to meet current and potential future targets without the inclusion of certain technologies

What industries are projected to grow, and to what extent, as a result of incentives associated with the standard

Whether the public health and environmental benefits of the growing clean energy industries supported by the standard are by equitably distributed across... environmental justice communities
Subjects to be Addressed

Whether the State is likely to meet its existing goals… and if the State were to increase those goals, whether electricity suppliers should expect to find an adequate supply to meet the additional demand for credits

Additional opportunities that may be available to promote local job creation within the industries that are projected to grow as a result of the standard

System flexibility that the State would need under future goals… including the quantities for peak and ramping that may be required
How energy storage technology and other flexibility resources should continue to be addressed… including:

(I) Whether the resources should be encouraged through a procurement, a production, or an installation incentive

(II) The advisability of providing incentives for energy storage devices to increase hosting capacity of increased renewable on-site generation on the distribution system

(III) Discussion of the costs and benefits of energy storage deployment in the State under future goals scenarios
Subjects to be Addressed

The role of in-State clean energy in achieving greenhouse gas emission reductions and promoting local jobs and economic activity.

Maryland 2014 GHG Emissions by Sector

Source: MDE 39
An assessment of any change in Solar REC prices over the immediate 24 months preceding the Interim Report

Bid Prices for Maryland, Last 12 Months

Source: SREC Trade
Maryland Department of Natural Resources

Request for Proposals Solicitation RFP-XXX

Issue Date: TBD

Power Plant Research Advisory Council (PPRAC)
2 new PPRP initiatives - Energy Storage Study and RPS Study

- RPS Study (HB1414/SB1146)
- Energy Storage Study (HB773/SB715)
Purpose and Timeline

• HB 773 states, “PPRP shall conduct a study to determine what regulatory reforms and market incentives are necessary or beneficial to increase the use of energy storage devices in the State in a manner that is fair and open to all stakeholders.”

• Major Milestones:
  • Jan. 31, 2018: Preliminary Findings
  • Jul. 31, 2018: Draft Report
  • Aug. 2018: Public Meetings (TBD)
  • Dec. 1, 2018: Final Report
Subjects Listed in HB 773

• The types and viability of different technologies and applications
• Wholesale market opportunities and challenges
• What other states are doing to promote energy storage
• Policy-related barriers to capturing societal benefits
• Cost recovery mechanisms
Subjects Listed in HB 773

- Efficient and timely interconnection processes
- Whether pumped hydro should be eligible for policy support
- Supporting both BTM systems and T&D-connected systems
- Appropriate standards and metrics for comparing systems
- Promoting diverse ownership models
Stakeholders Listed in HB 773

- The Public Service Commission (PSC);
- The Office of People’s Counsel (OPC);
- The Maryland Energy Administration (MEA);
- Environmental organizations;
- Electric companies;
- Third-party providers of energy storage devices;
- Associations of third-party providers;
- The UMD Energy Innovation Institute (EII);
- The Maryland Clean Energy Center (MCEC);
- Developers and owners of electricity generation; and
- Other interested parties.

*Overlaps with the Public Power Research Advisory Committee (PPRAC) Energy Storage Study Working Group are starred.
Project Strategy

- Literature review of reports by EEI, EPRI, ESA, FERC, IREC, PJM, other states, etc.)
- Close cooperation with the PSC PC-44 Working Group
- PPRAC meetings (every spring and fall) and Working Group webinars/meetings (monthly, as needed)
- Site visit(s) to view and discuss features of one or more working energy storage systems in the region
- 1-on-1 conversations with stakeholders
- Public meeting(s) to preview major findings and invite feedback on Draft Report
- News monitoring (Energy Storage News, Utility Dive, etc.)
Recent Activities

- Meetings/Calls with Storage Development Community
  - Alevo Analytics, Energy Storage Association, Ingersoll Rand and Calmec, Flonium, Schneider Electric, Sunverge, Tesla, WindSoHy
- Meetings/Calls with other organizations
  - Edison Electric Institute, Del. Korman, UMD Energy Innovation Institute
- Field trip to AES storage project

AES 10 MW Energy Storage Battery in Cumberland, MD
Recent Activities (cont.)

• PSC-PPRP-MEA Coordination
  – Ongoing monitoring of PC 44 Integration & Energy Storage workgroups;
  – Monthly calls with MEA and PPRP;
  – Meeting with PSC staff experts to discuss regulatory sections of Energy Study outline, which PSC staff has agreed to draft or provide input on;
  – Coordination with Andrew Johnston on meetings/calls with stakeholders.

• Report Development
  – Completed draft report outline and style guide
  – Completing draft of Chapter 2. *Energy Storage Technologies*
2 new PPRP initiatives - Energy Storage Study and RPS Study

What’s Next – a look at what we may see in Maryland’s electricity future
What’s next?

“It's tough to make predictions, especially about the future.”

— Yogi Berra
What’s next?

- Increase in renewables to meet the RPS
- Several new Transmission Lines
- Natural gas?
- Onshore wind?
- Energy Storage?
- Offshore Wind?
- Other renewables?
Thank You!