The Grid – Survey of Modernization and Decarbonization Impacts

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Overview

Disclaimer: The views expressed in this presentation are my own and do not necessarily reflect those of the Commission.

- High Level Review of the Electric Grid
- Survey of Grid Modernization in Maryland
- Survey of Grid Decarbonization
  - Focus of impacts of renewables and electrification of the Grid
- Customer Considerations

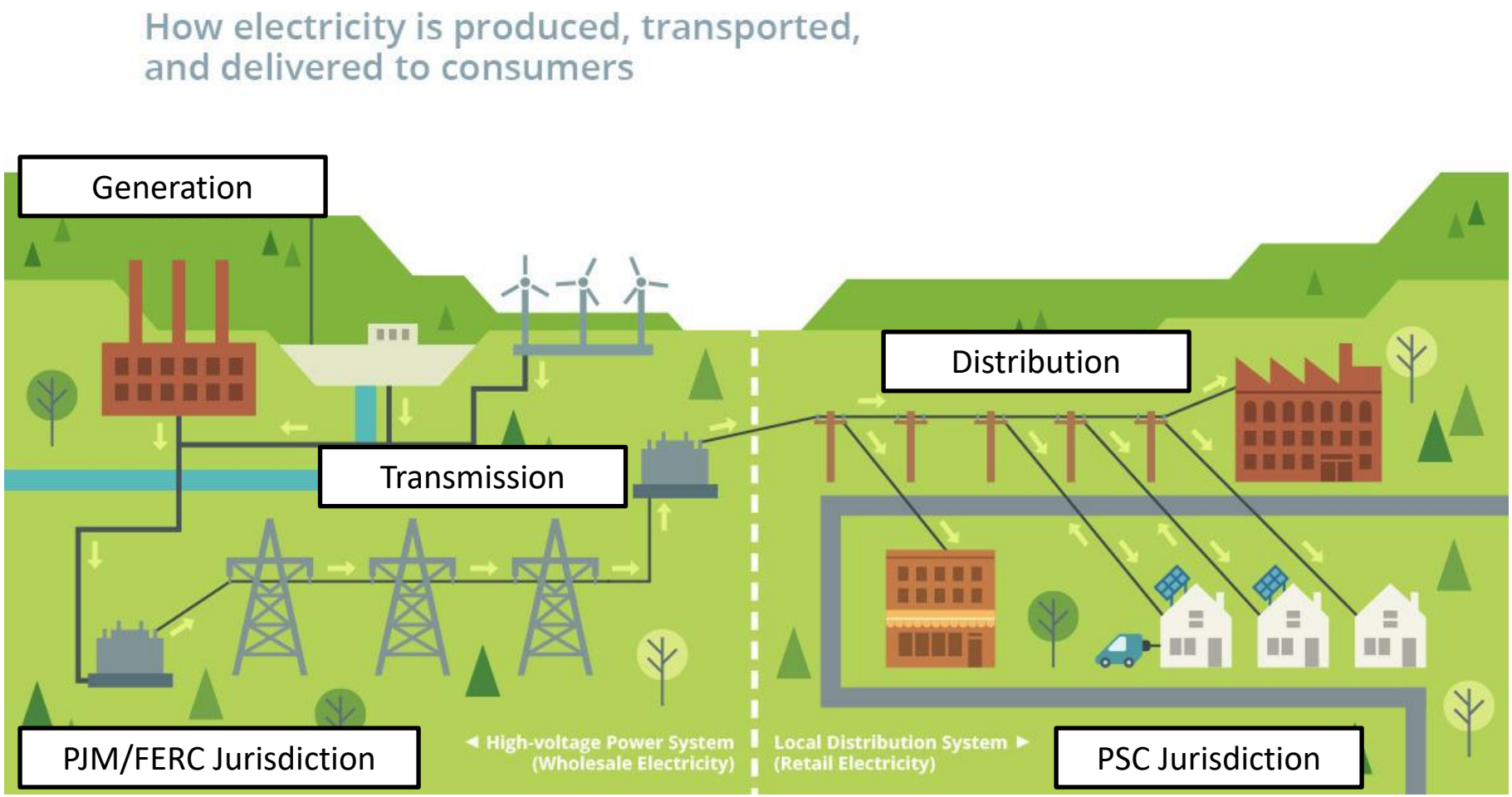
Electric Grid

- Utility systems consist of three parts: **Supply**, **Transmission**, **Distribution**
  - Electricity flow has traditionally been single direction. With advent of distributed generation, flow of electricity can now go both ways (e.g. solar)
  - Need to ensure there is enough supply and a sufficient network to move the supply to instantaneously meet customers demand within reasonable parameters

- MD PSC has regulatory jurisdiction over the utility **distribution** system, e.g. rate setting
  - Mission of the Public Service Commission is to ensure safe, reliable, and economic public utility and transportation service to the citizens of Maryland.

- PSC has limited authority over **supply** and **transmission**.
  - Jurisdiction of FERC and planned and operated by PJM
  - Supply + Transmission = Wholesale Market
  - Maryland utilities procure capacity, energy, and other ancillary services from wholesale market.

High Level Electric System Example



ISO New England (https://www.iso-ne.com/about/what-we-do/in-depth/how-electricity-flows-from-wholesale-to-retail)

Grid Modernization

- Means many things but effectively the integration of recent innovations into grid operations and planning
  - Examples include real time information (e.g. AMI), distributed generation, energy storage, smart inverters, and bi-directional flow of electricity among other things
- PSC has led and continues to lead various efforts to modernize the grid
- State has passed several laws that influence the modernization of the grid

Grid Modernization – PSC Level

- Commission held PC44 to examine grid modernization efforts through various stakeholder work groups (started in 2017)
  - Time of Use Pilot
  - EV Pilot
  - Interconnection Standards
  - Energy Storage Evaluation Standards (incorporated into legislatively mandated energy storage pilot)
  - Retail Market Enhancements
  - Distribution System Planning
- Advanced Metering Infrastructure

Grid Modernization – Legislation

- 3000 MW of Net Metering
- Permanent Community solar program
- 8 energy storage pilots examining different ownership and operation models. Priority to projects that defer distribution upgrades (Currently underway)
- Set goals utilities must incorporate when planning distribution systems (final implementation end of 2024 and mid 2025)

Other Grid Decarbonization Tools

- State has aggressive decarbonization goals which will ultimately rely upon a decarbonized energy sector
  - MDE currently developing next iteration greenhouse gas reduction plan
- Examples of Legislative Requirements:
  - Renewable Portfolio Standard (RPS)
    - 52.5% of retail sales are RPS by 2030
  - Energy Storage
    - Goal of cost effectively deploying 3000 MW of storage by 2033
  - Energy Efficiency & Demand Response
    - Increase EE reductions 2.5% of 2016 baseline by 2027
  - Electrification
    - Vehicles and Buildings

RPS

- Renewables 52.5% of retail sales by 2030
  - Specific carve outs for solar, offshore wind, and geothermal
  - Can be generated in PJM or a PJM adjacent state if delivered into PJM
  - Certain fuels only qualify if connected to the Maryland gird
- RPS compliance does not necessarily mean delivery of renewables to Maryland
  - Company obligations can be fulfilled by purchasing Renewable Energy Credits
  - RECs are certificates that show renewable energy was produced. These are used to monetize the green aspect of renewables and show compliance with the law.
  - Will become more operationally challenging if standards change such that load must be served with renewable output

Challenges of Integrating Renewables onto Grid

- Intermittent vs dispatchable generation
- Can grid planners rely upon it?
  - Renewable capacity is not a 1-1 replacement with dispatchable generation
  - Non-wires Solutions
- Preserve grid reliability & stability
- Deployment
  - Interconnection Queue
  - Zoning
  - Hosting Capacity

Electrification

- Convert applications that currently rely upon fossil fuel to electricity
  - Underlying premise = The emissions intensity of electricity is less carbon intensive than the fossil fuel it is replacing
- Climate Solutions Now Act
  - PSC study involving electric and gas utilities to study the grid capacity impacts of electrification
  - MDE developing Building Energy Performance Standards
- State of Maryland EV Goals
  - 300,000 Light-Duty EVs by 2030
  - Medium & Heavy-Duty MOU
  - MD adopted CA standards = 100% EV new car sales by 2035

Grid Planning Considerations for Electrification

- Peak management and load shape shifting will be important when pursuing electrification
- Will increase need to deploy generation capacity and the ability to move energy simultaneously
  - Think of grid like your house circuit breaker
    - Not enough supply impacts power availability & stability (e.g. outages, flickering lights)
    - Try to use too much energy at once and blow a fuse
- Examples of mitigation measures include, but are not limited to:
  - Deploying efficient measures when electrifying
  - Price signals for customers to not use energy at peak load hours
  - Make-ready programs

Ratepayer Considerations

- The future impact to ratepayers is unknown
  - Potential Increases: Procure additional generation, integrating variable generation onto the grid, distribution upgrades to serve increases in load and integrate distributed energy resources
    - If electrification of the natural gas system occurs there may be increasing cost pressures on customers that remain.
  - Potential Decreases: More sales to spread cost over, better load management tools, better consumer price signals, low operational cost of renewables, greater stakeholder transparency into utility planning.
- Regressive nature of rates
  - Rates based on cost of service, not able to pay
  - Affordability and Equity concerns
- Some policies may require upfront cost to customers to participate and consideration should be given to what types of subsidies are appropriate to encourage some of these policies

Thank you and Questions?

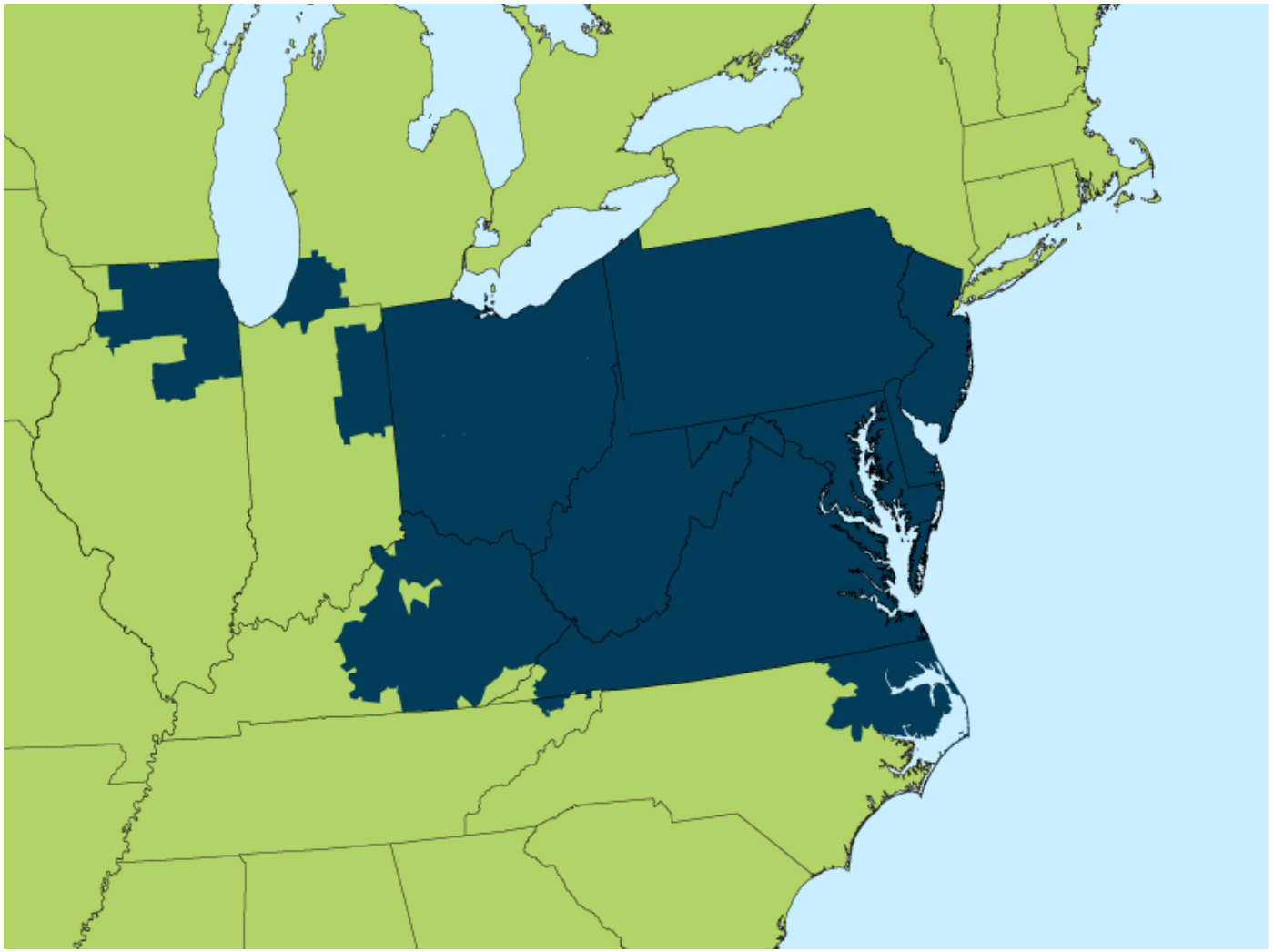
Appendix

FERC/PJM

- Federal Energy Regulatory Commission: Regulates the interstate commerce and reliability of electricity and gas
  - Wholesale markets for sale of electricity
  - Transmission of gas and electricity.

- PJM: Oversees the reliability and safety of the bulk electric power system and the operations of the power market serving 13 states and D.C. (including MD)

PJM Footprint



PJM Website: https://www.pjm.com/about-pjm/who-we-are/territory-served#:~:text=PJM%20Interconnection%20coordinates%20the%20movement,and%20the%20District%20of%20Columbia.

Types of Generation

- Solar
- Wind
- Geothermal
- Nuclear
- Coal
- Hydro
- Natural Gas
- Biomass

Commission Oversight of Distribution Utilities

- Setting Utility Rates
- Setting standard utility practices via tariffs
- Safety and Reliability Standards
- Implementing programs required by the legislature
- Low-Income programs

Utility Cost Recovery

- PSC oversees utility distribution rate cases to determine the amount of money owed a utility and the rates charged to customers
- Utilities earn a return on rate base
- Customer rates are cost-of-service based.
- Three types of rates
  - Fixed charge, Variable rate, Demand charge

Types of Rate Cases

- Two types of rate cases
- Traditional
  - Rates are based on historical spend
- Multi-Year Rate Plan
  - Rates based on forecasts spend over three years
  - Prudency review and true up occur at end of three years
  - Commission is currently piloting with Exelon utilities

Ratemaking Principles

- Customer rationing/economic efficiency
- Avoidance of rate-shock
- Gradualism
- Effectiveness in yielding the revenue requirement
- Fair cost apportionment
- Understandability of Rates
- State Policy Goals

www.psc.state.md.us