Overview of the Electric Distribution System in Maryland

Presented to the Energy Resilience and Efficiency Working Group of the Maryland Commission on Climate Change

July 16, 2024

Mark Zucca, Advisor, Maryland Regulatory Affairs

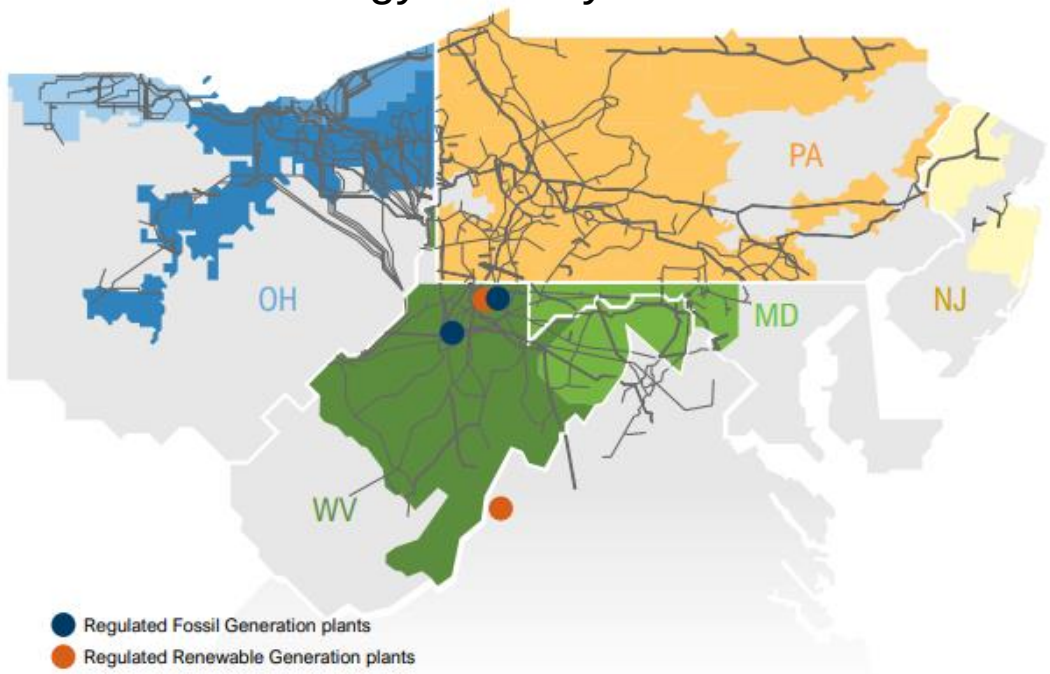
Agenda

- Introduction and overview of EDCs
- Current state of the distribution grid
- Interconnection rules and evolution
- Distribution system planning process advancements
- Distributed Energy Resources (DER) and energy storage
- Distribution system resiliency

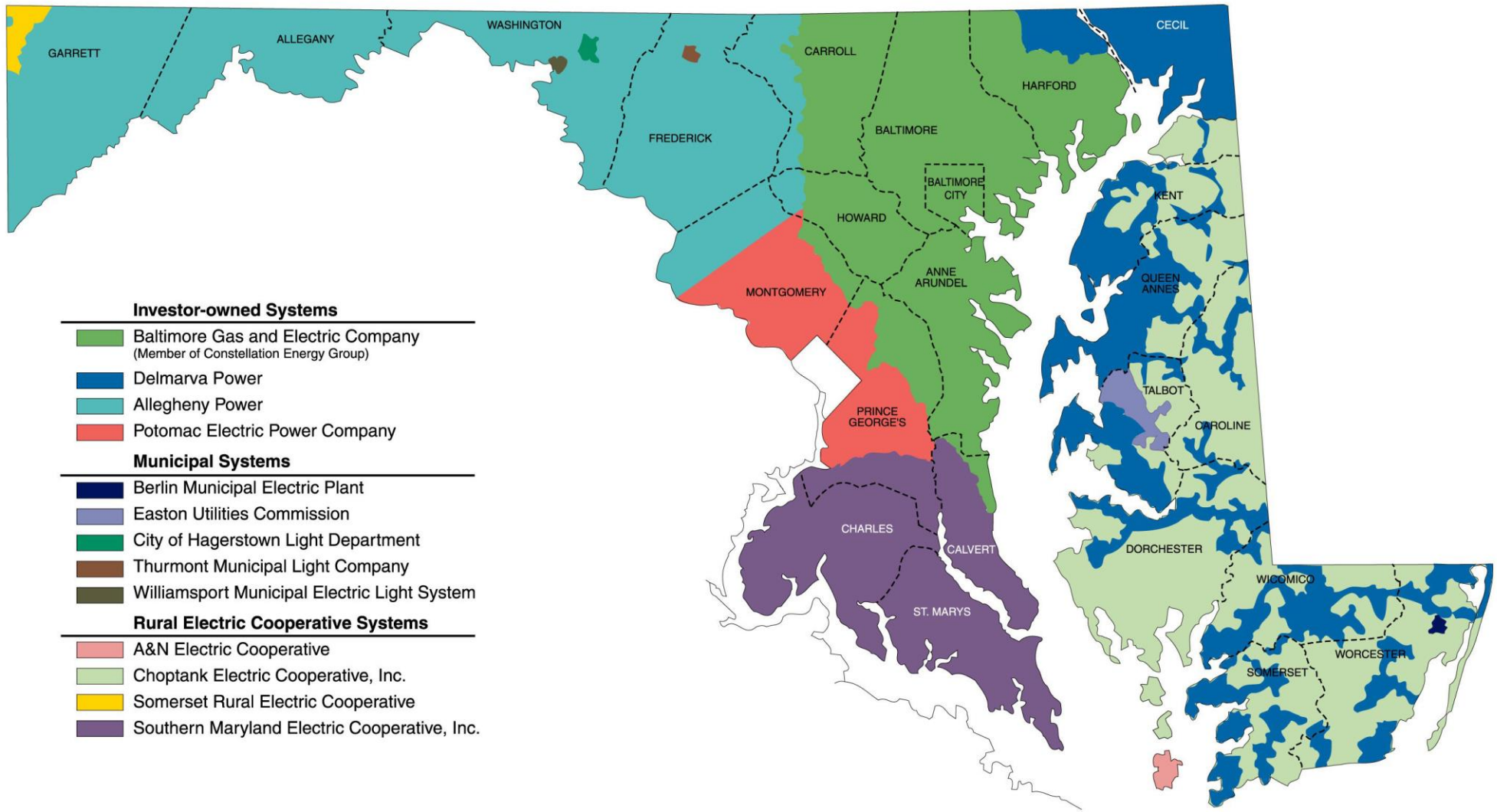
Introduction and Overview

- Introduction of FirstEnergy and Potomac Edison
- Maryland Electric Distribution Company (EDC) Territories
- Maryland EDCs may own and operate transmission assets in addition to distribution facilities
- EDCs are solely responsible for reliability of the electric distribution systems within their territory

FirstEnergy Territory Overview



Maryland EDC Territory Overview



Current State of Distribution Grid

- Distribution system is typically radial, as compared to networked transmission
- Substations transform transmission-level power to distribution-level and individual circuits feed to customers
- Power generally flows from substations to load in one direction
- Power system components, such as voltage regulators, circuit breakers, etc., were designed for one-way power flow
- System improvements are typically caused by increases in load

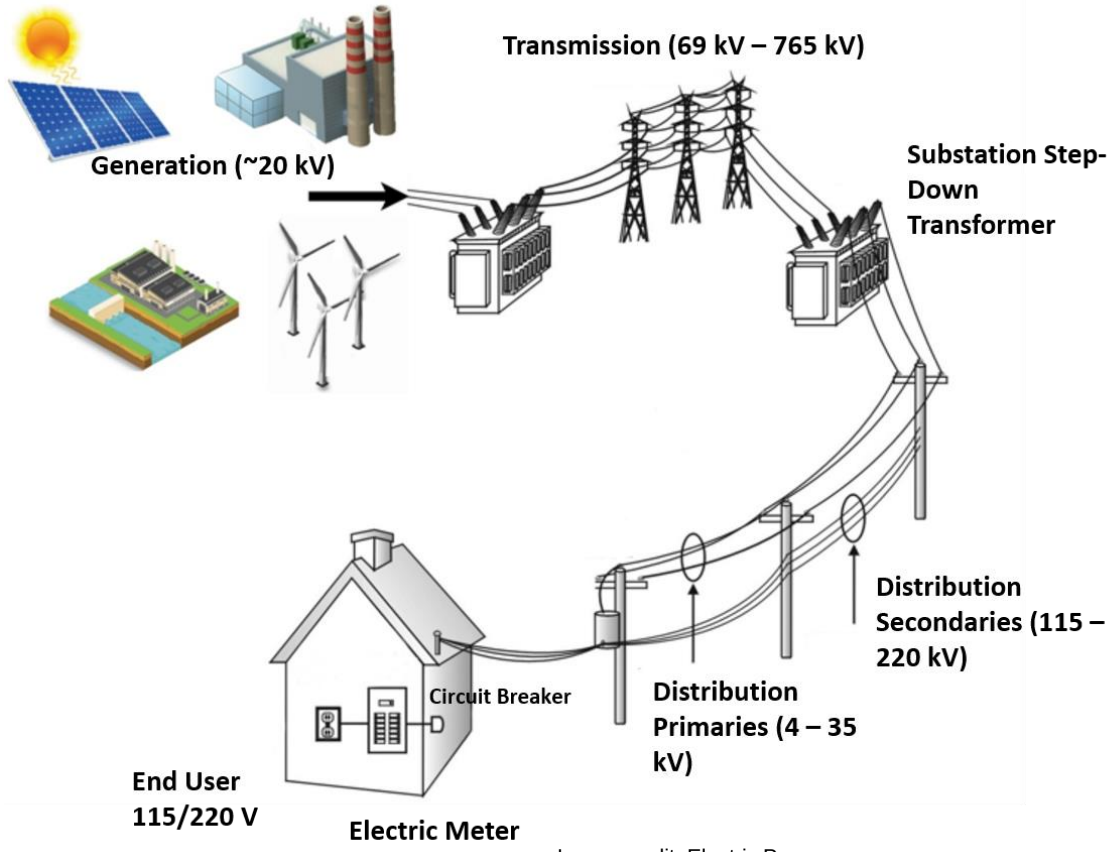


Image credit: Electric Power Research Institute

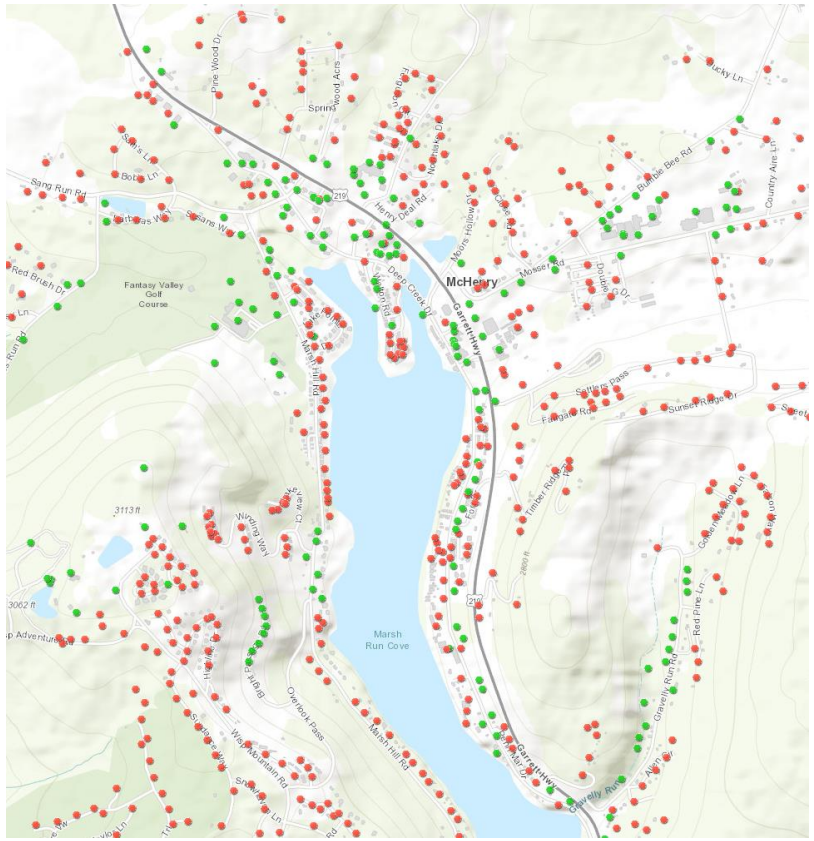
Distributed Energy Resource Interconnection Rules

- Retail interconnections, state regulations
- Since inception, rules have typically been “causer pays” – if you want to connect, you pay the entire cost of grid upgrades
- Assumption is worst case effect on distribution system – evolved from “rules of thumb” screens
- Detailed studies required to determine cost of adding DER at each location

Recent Advancements:

- Some states including MD are moving to “beneficiary pays” – more costs are spread among project developers
- Power system analysis software allowing for more advanced power system modeling (power flow analysis)
- Modeling can allow for some advanced information on efficient grid connections, but limitations exist

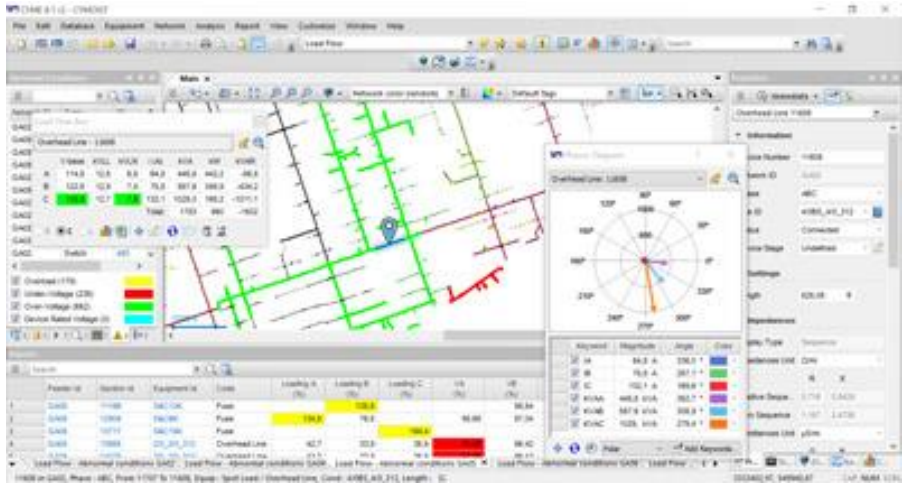
PE Hosting Capacity Map
Green – More available capacity
Red – Less available capacity



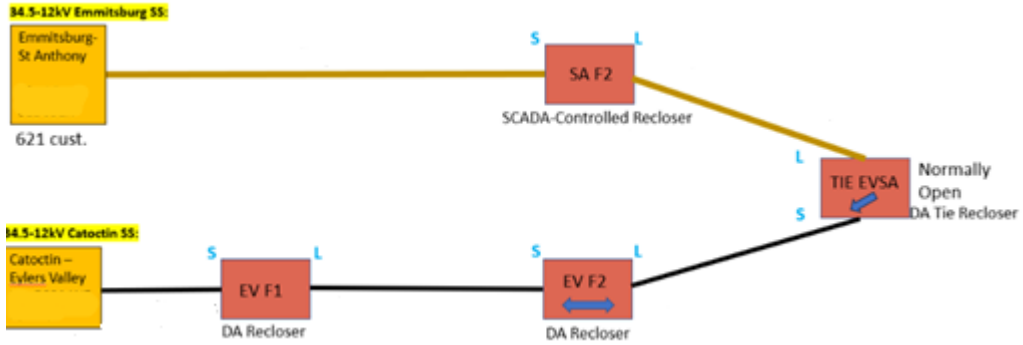
Credit: Potomac Edison

Distribution System Planning Process Advancements

- Overview of utility DSP practices – regular reviews at the circuit / transformer level
- Looks ahead in different time blocks – such as 12 months/ 5 years/ 10 years
- Introducing forecasts for DER in addition to load
- Bi-directional power flow – unlocks increased system reliability and DER integration



Credit: Eaton, Inc CYME Dist software



Credit: Potomac Edison

DER and Energy Storage

- Maryland Energy Storage Pilot Program – approx. 8.5MW
- Maryland Energy Storage Initiative – Target of 3,000MW by 2033
  - Includes all technologies, including thermal, electrochemical, VPP, hydrogen, and others
- Example: Potomac Edison Myersville Energy Storage and EV Charging System
- Benefits storage can provide to the distribution system
- Challenges of integrating storage
- Utilizing storage as a capacity resource on the distribution system

Potomac Edison Myersville Energy Storage Site

Distribution System Resiliency

- Overview of utility storm restoration process
- Collaboration with state/county/local officials
- Potential to incorporate DER, including customer and utility-owned microgrids
- MD PSC Resiliency Work Group discussing metrics and how resiliency programs can be evaluated

Credit: FirstEnergy Corp.