Innovation & Grid-Enhancing Technologies at PJM

Michael Bryson
Sr. Vice President – Operations

OPSI Annual Meeting – Session 3

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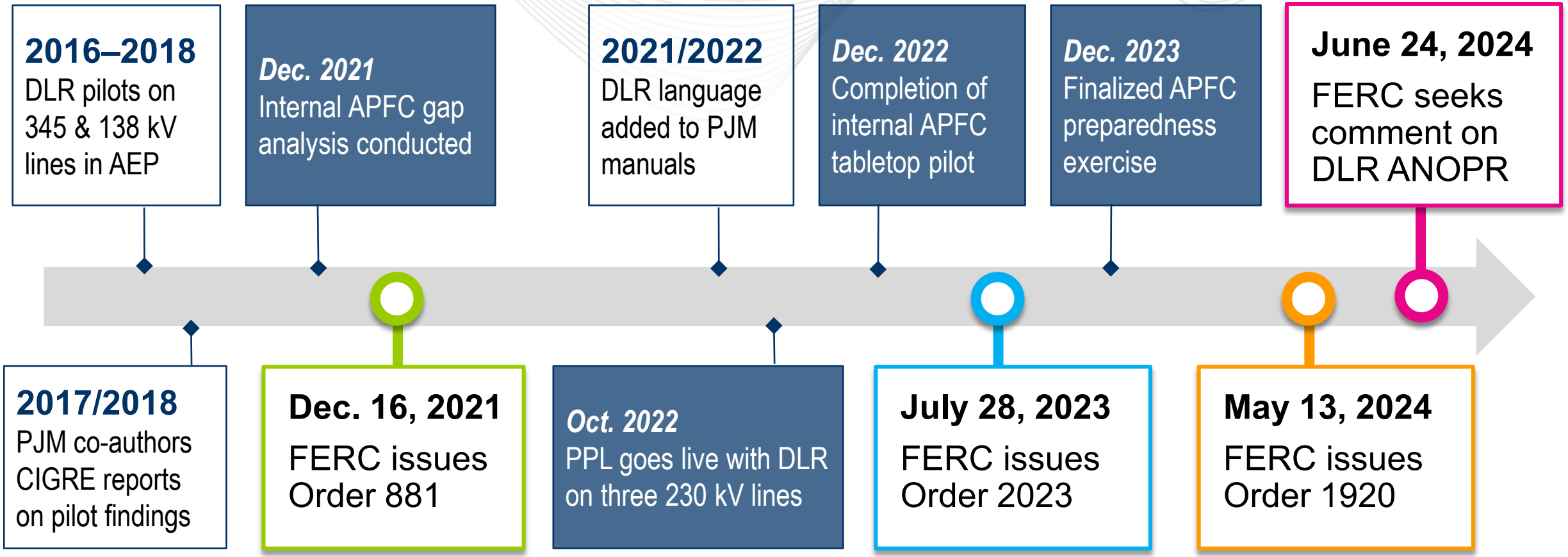
PJM's GETs Journey



All led to PJM's 2024 commitment to publicly publish a series of GETs Technical Application Guides.

DLRs in PJM Footprint

Policy Developments

- **FERC Order 881 –** Provides regulatory support
- Standards for implementation created by NERC

Pilots

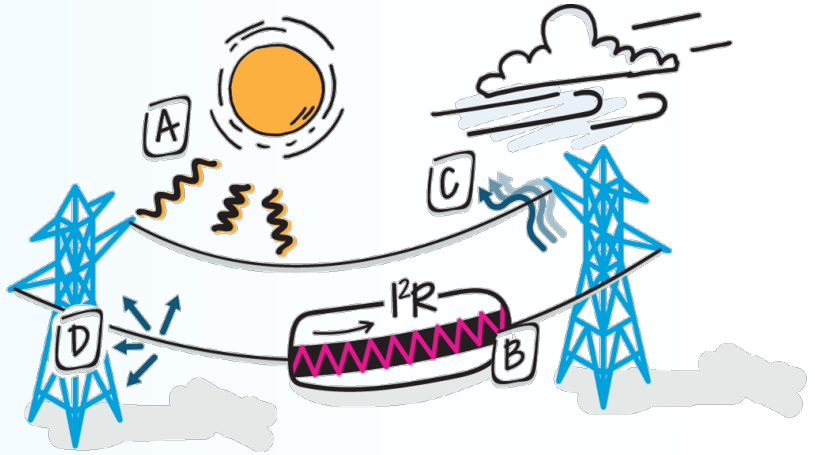
- **12+ pilots conducted** across PJM footprint
- Infrastructure/implementation issues in PJM addressed

Outcomes

- DLR devices in production in PJM footprint
- **Enhanced Grid Operations** – PJM system is ready

Dynamic Line Rating Devices:

- Use advanced sensors and software to monitor real-time environmental conditions of a transmission line.
- Monitor real-time environmental conditions, like temperature and wind speed, to calculate actual line rating.



PJM's DLR Experience

PPL Implementation

- **230 kV** lines on Harwood-Susquehanna (1 & 2) and Cumberland-Juniata
- In-service since October 2022 with no operational concerns

  Cumberland-Juniata decommissioned December 2023
- Cumberland-Juniata congestion decreased from $66 M in the 2021–2022 winter to $1.6 M in the 2022–2023 winter.*

  This does not consider potential congestion pushed to other areas or upgrades that also impacted congestion.

AEP Pilot

- **345 kV** Cook-Olive line
- Three sensors
- Data monitored November 2016 to August 2017
- Simulated line congestion decreased by $11 M with overall congestion savings of $4.2 M.**

*PPL Supplemental Comments

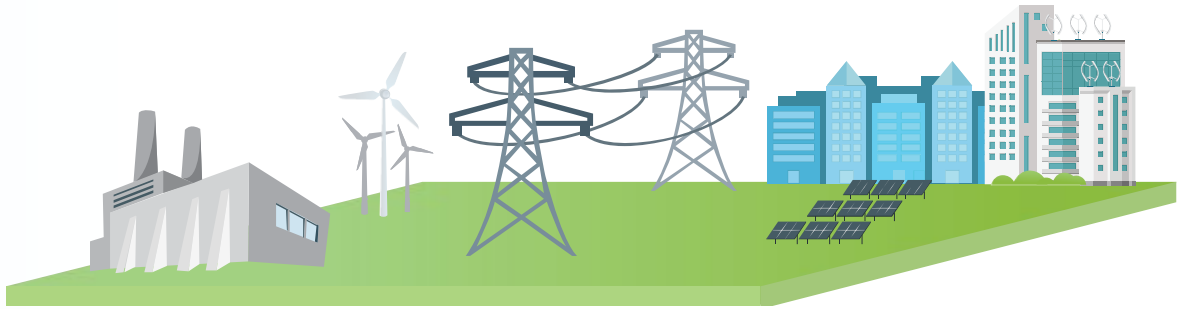
**2021 Operating Committee presentation

Topology Optimization

Topology Control at PJM:

- Operational tool used to evaluate the entirety of the PJM footprint and interaction with our neighbors
- The topology control software in place today identifies benefits from known transmission switching and makes recommendations to alleviate constraints.
- Increases operational flexibility and lowers generation costs

Topology control is used to redirect power flows.

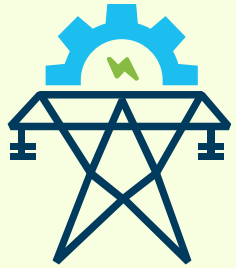


PJM software runs every 15 minutes

Advances on the practice of manually identifying topology changes

Provides ongoing assessment of network configurations and recommended actions

Suggested actions are appropriate and identified where system reliability can be maintained.



Topology Optimization

Topology optimization identifies topology reconfigurations based on system conditions to minimize off-cost operations.

Benefits:

- Reconfiguration can help reduce congestion.
- Manage potential overloads on the system in real time and near real time

Other Considerations:

- Potential for degradation of equipment
- Reliability risk from frequent switching

PJM utilizes transmission switching for reliability in two primary ways:

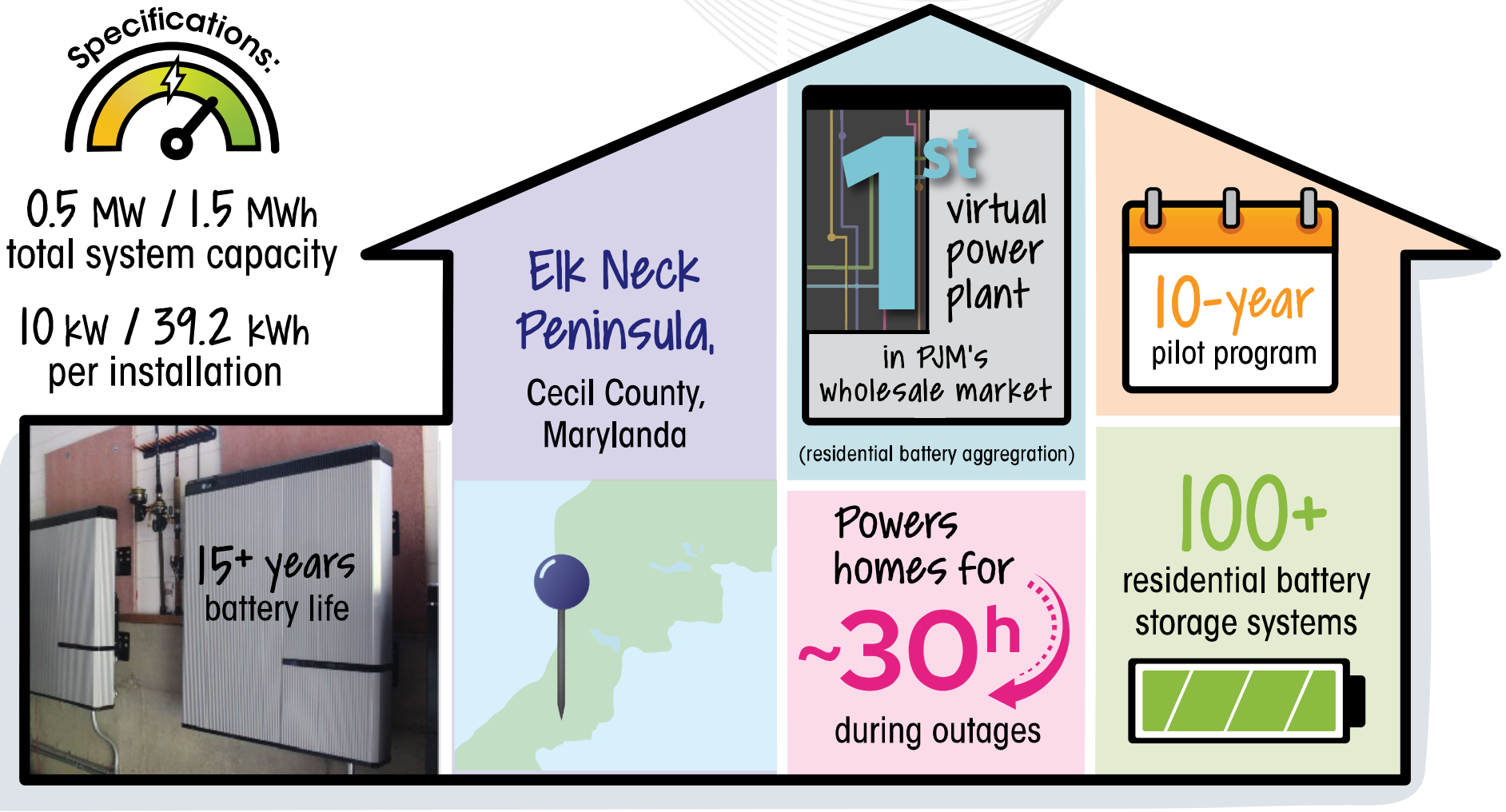
MANUAL IDENTIFICATION

- Maintain a predefined list to address specific system conditions such as outage or common constraints
- Coordinated with the TO

OPTIMIZATION

- A real-time tool (Real-time Topology Control) runs every 15 minutes to programmatically evaluate trending thermal issues and recommends optimal switching.
- Manually studied by PJM and vetted with the TO prior to implementing

Virtual Power Plants (VPPs)



In March 2021,
FERC issued
Order 2222

Wholesale market operators required to develop a market participation model for DER aggregation

PJM and Delmarva Power partnered to explore the new Elk Neck Battery Storage VPP.

Storage as a Transmission Asset (SATA)

Policy Developments

- **FERC issued a policy statement providing guidance.**
- Three potential issues:
  1. Double recovery of costs
  2. Adverse impacts on wholesale markets
  3. Level of operational control of the storage resource by an RTO

Phase 1 at PJM

- PJM Planning Committee conducted process to consider SATA.
- Developed transmission planning criteria and a proposed solution

Next Steps

- **New stakeholder effort –** October – 2nd Read at MRC
- Problem Statement/Issue Charge for SATA