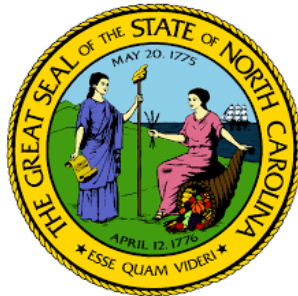


North Carolina Utilities Commission Public Staff

Jeff Thomas, PE
Utilities Engineer



Coordination Between Interconnection and Grid Planning - i2X Webinar Series

Disclaimer: The views presented are my own and not necessarily the position of the NC Public Staff.

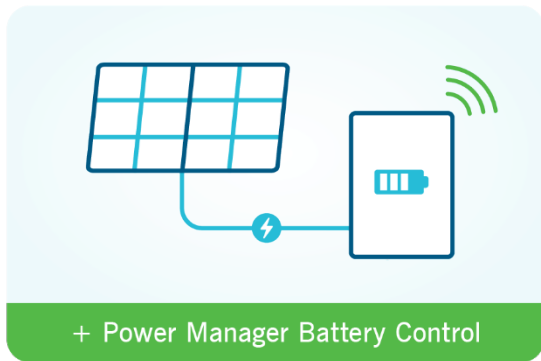


3.5 Interconnection of DER

- ▶ NC Interconnection Procedures (NCIP)
 - ▶ Transitioned from Serial to Cluster Studies in 2020.
 - ▶ Eliminated backlog of interconnection requests.
 - ▶ Streamlined study process; more predictable outcomes.
- ▶ Current focus has been on larger, utility-scale generation...
 - ▶ ...but DERs can address challenges caused by interconnection constraints
 - ▶ “Shrink the challenge”
- ▶ Efforts to coordinate generation, transmission, and distribution:
 - ▶ Duke’s Integrated Systems and Operations Planning (ISOP)
 - ▶ Dominion’s Integrated Distribution Planning - (ADP)
 - ▶ NCEMC’s Distributed Energy Resource Management Software (DERMS)

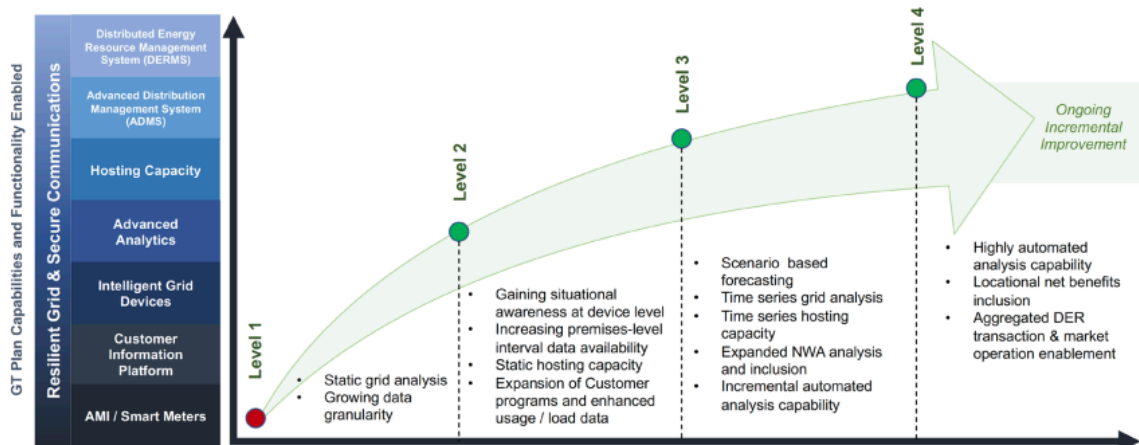
3.5 DER Aggregation

- ▶ DER aggregation is not new to NC - utilities dispatch demand response via third-party aggregators today.
 - ▶ No independent DER integration in Duke's territory.
- ▶ PJM - Order 2222 aggregated DER for the 2028/2029 BRA.
- ▶ Duke's Power Pair + Battery DR
 - ▶ Upfront incentives to install residential solar and storage.
 - ▶ Batteries dispatched as DR via aggregator.



3.6 Distribution Planning

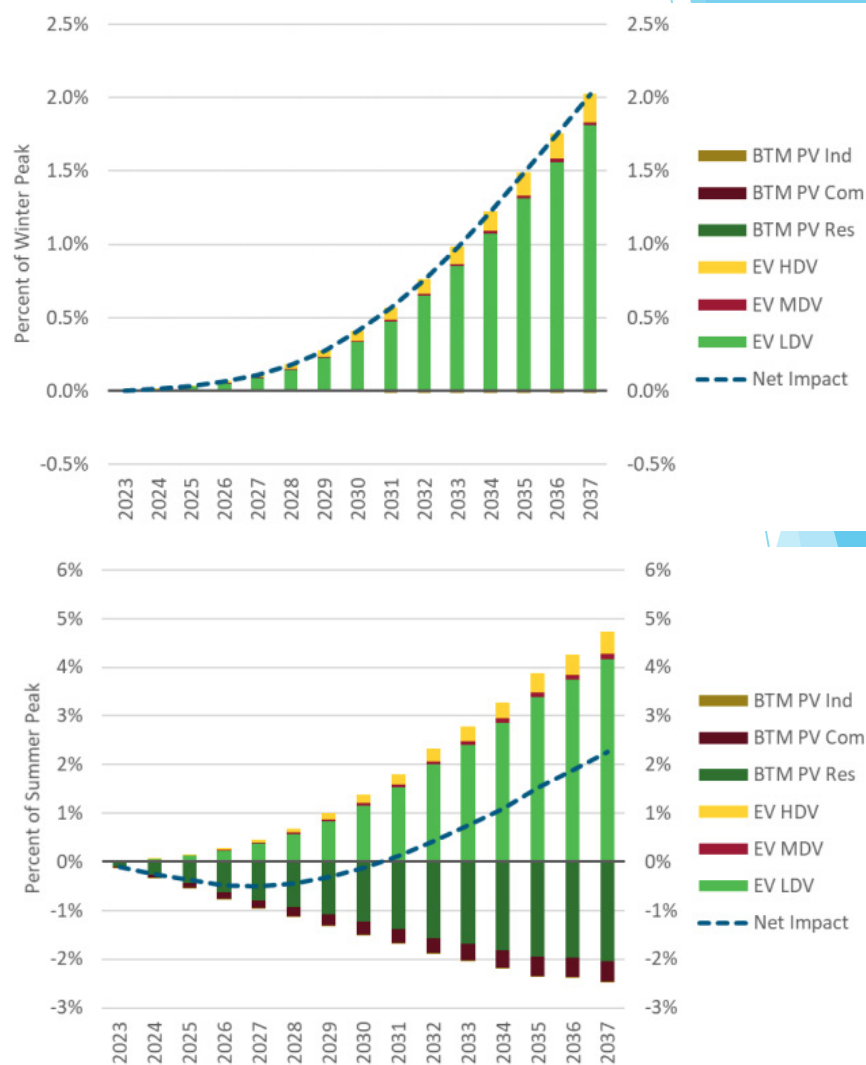
- ▶ ISOP and IDP are promising integration of system planning from generation to distribution.
- ▶ Involves the deployment of multiple tools to manage DERs and the distribution system - core capabilities and functionality:
 - ▶ AMI / Smart meter deployment
 - ▶ Development of consolidated data systems (G/T/D) and teams
 - ▶ Evaluation tools for non-wires alternatives, primarily batteries
 - ▶ Scenario-based forecasting
 - ▶ Automated analysis for interconnection studies



Source; Dominion Energy Grid Transformation Plan, Phase II, 2021

3.6 DER Coordination

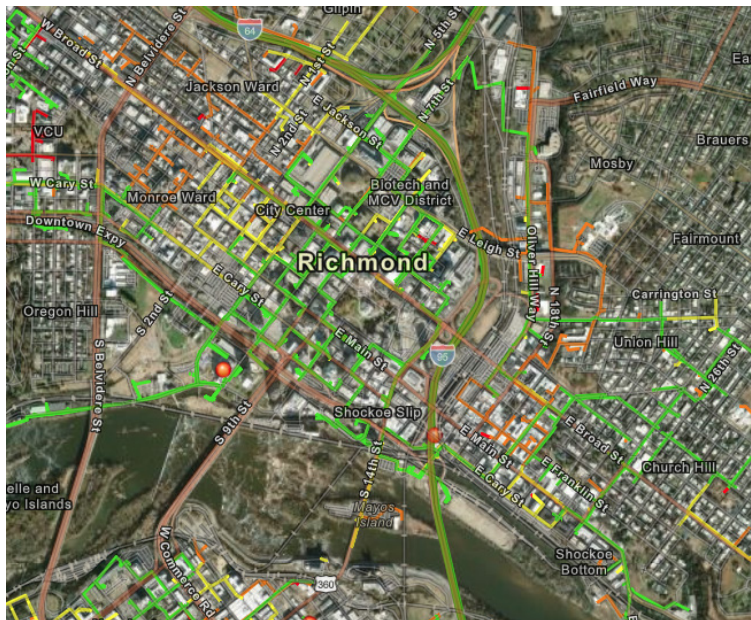
- ▶ ISOP Morecast - circuit-level load forecasts that consider DER deployment, incorporated into system planning.
 - ▶ Influences distribution grid investments (proactive capacity upgrades)
 - ▶ Modifies IRP load forecasts
- ▶ DR dispatchable, but not selectable, in IRP.
- ▶ EE, PV, EV applied to gross load.



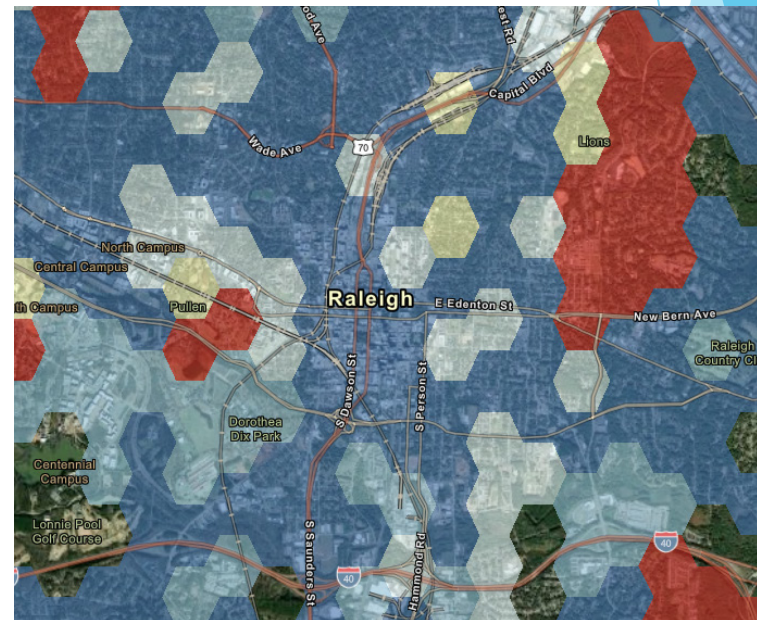
Source: Duke Energy 2023 CPIRP, Appendix D

3.6 DER Coordination

- ▶ Duke's DER Dispatch tool automates control of solar and storage DERs
- ▶ Locational guidance and hosting capacity maps can guide DERs to areas without grid constraints.
 - ▶ Transmission capacity heat maps required by FERC Order 2023.
 - ▶ Distribution hosting capacity maps currently available.



Source: Dominion Energy Distribution Hosting Capacity Map



Source: Duke Energy Distribution Hosting Capacity Map

3.7 DER Interconnection

- ▶ Interconnection process differentiates between nameplate and requested export capacity.
 - ▶ 30 MW solar + 10 MW battery may request only 30 MW export capacity.
 - ▶ Interconnection Agreements limit output to the requested exports
- ▶ Must provide output profile for use in peak / valley load studies.
- ▶ ESS Retrofit process

Total Generator/ Storage Nameplate Capacity: _____ kWAC (Typical) _____ kVAR

Storage Nameplate Energy: _____ kWh

Interconnection Customer or Customer-Site Load: _____ kWAC (if none, so state)

Interconnection Customer Generator Auxiliary Load: _____ kWAC

Typical Reactive Load (if known): _____ kVAR

Maximum Generating Capacity Requested: _____ kWAC

(The maximum continuous electrical output of the Generating Facility at any time at a power factor of approximately unity as measured at the Point of Interconnection and the maximum kW delivered to the Utility during any metering period)

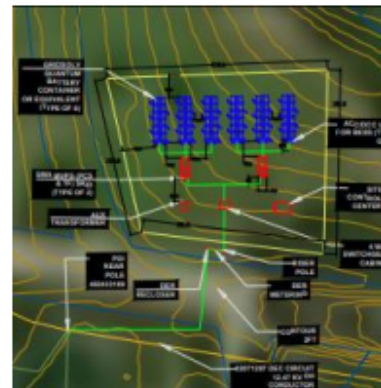
3.8 Potential Grid Benefits

- ▶ Primary space for consideration of NWA benefits from DER is distribution planning.
 - ▶ Capacity upgrades: consider BTM solar and storage.
 - ▶ Fleet electrification projects: identify corporate shifts towards EVs.
 - ▶ Batteries: deployed to reduce outage frequency, duration.
 - ▶ Benefits include operational savings, reduced customer outages, energy, capacity, and ancillary service cost reductions.

Project: Farris Bridge

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County	Pickens	Functions
Power	5.3 MW	Reliability
Energy	25.0 MWh	Energy Arbitrage
CAPEX (\$MM)	\$24.0	Capacity
Estimated ISD	Sep'25	Ancillary Services
Point of Interconnection	Distribution	
PMCOE Milestone/Date	Select – Jan'21	
Associated Substation	Berea Rd Retail	



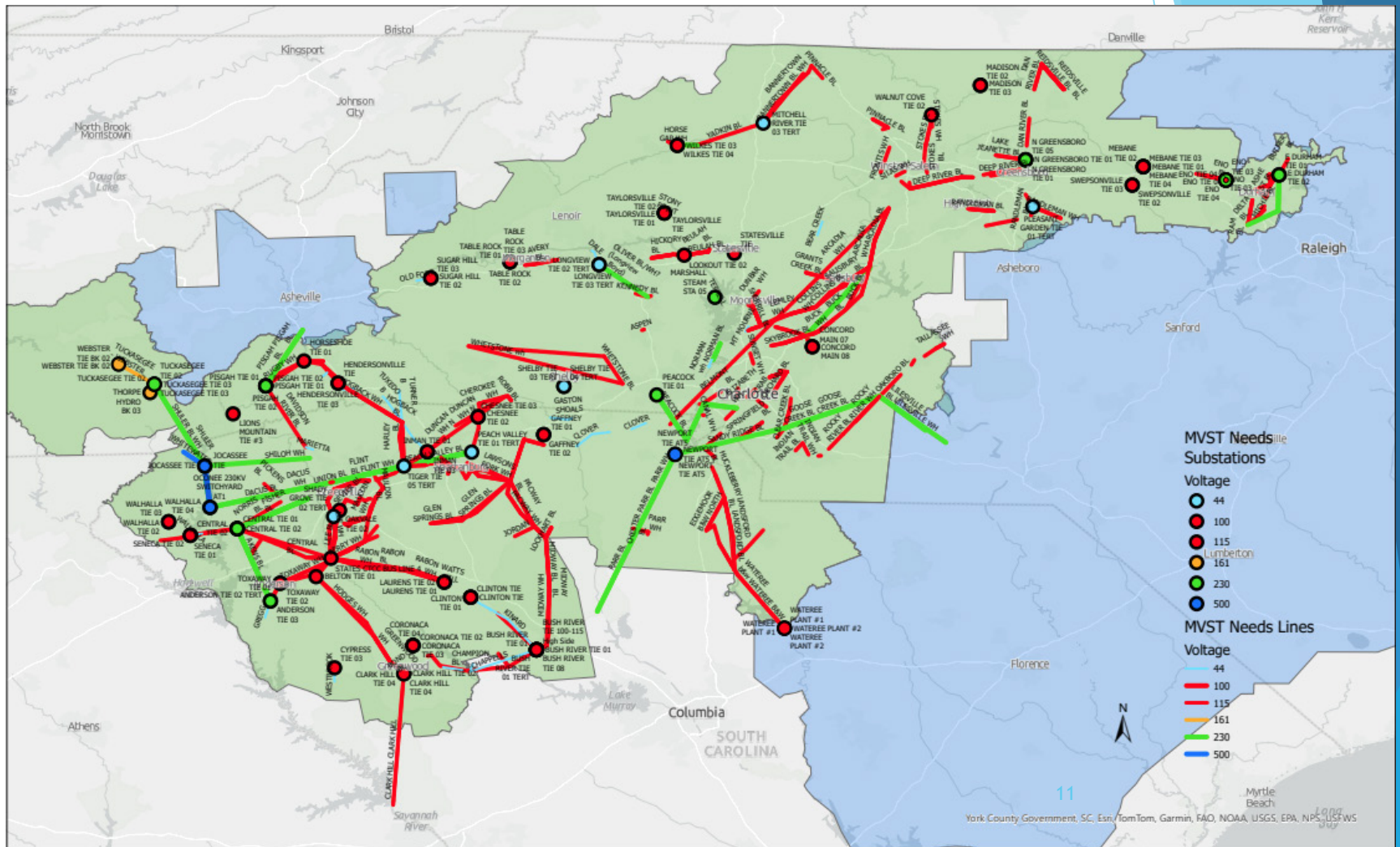
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3.8 Potential Grid Benefits

- ▶ FERC Order 2023 requires long-term transmission planning that incorporates a range of plausible scenarios and considers grid benefits.
- ▶ Duke has begun to roll out its Multi-Value Strategic Transmission (MVST) **local** planning process:
 - ▶ Studies wide range of plausible scenarios and sensitivities from most recent IRP.
 - ▶ Identifies system overloads and selects proposed solutions by applying selection criteria.
 - ▶ Estimates benefits (avoided capacity and energy costs, congestion and fuel savings, reduced losses, avoided outages, deferring transmission investments).
- ▶ Dominion evaluates the benefits of its Grid Transformation Plan (avoided/deferred capital, O&M savings, avoided energy and capacity costs, reliability).

3.8 MVST Results (DEC)



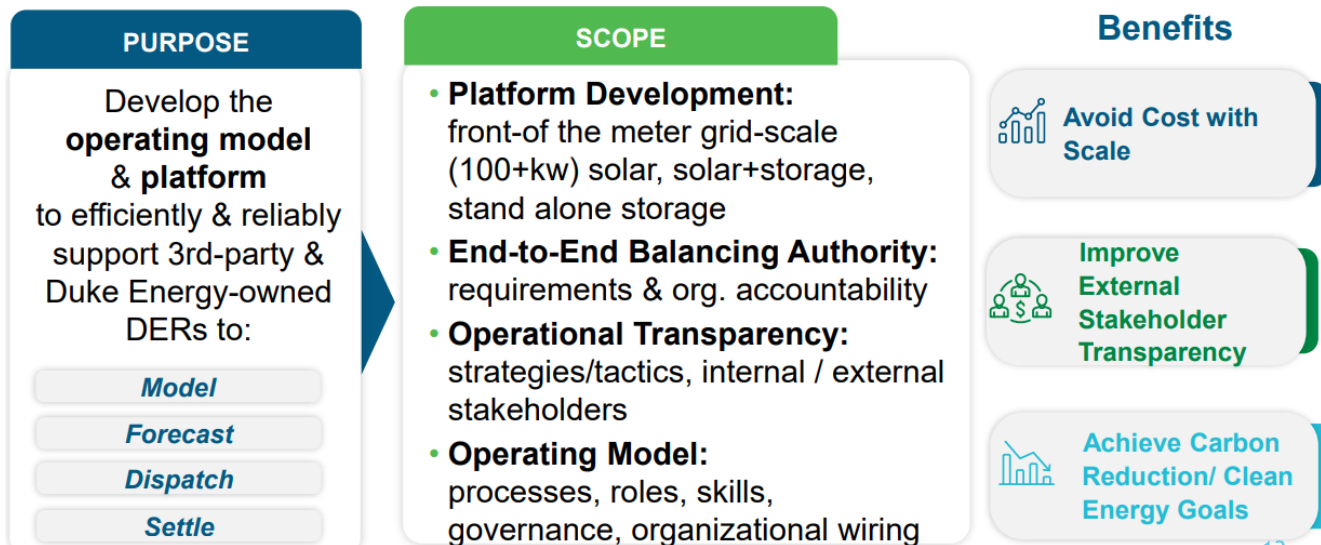


3.9 Flexible Interconnection

- ▶ Under both NCIP and LGIP, flexible interconnection is possible:
 - ▶ ERIS instead of NRIS.
 - ▶ **Provisional Service.**
 - ▶ Only recently allowed for state-jurisdictional projects under NCIP
- ▶ Limited economic curtailment compensation (5/10% of annual output for RFP winners).
 - ▶ No compensation for curtailment due to system emergencies or transmission constraints.
- ▶ Can speed interconnection, potentially enable a project to meet construction deadlines for federal tax credits.

3.9 Flexible Interconnection

- ▶ Utilities are investing in DER management software to enable utility control of grid-connected DER.
 - ▶ DER Management System (DERMS) to manage DERs, including curtailment.
 - ▶ Duke: DER operational integration and forecasting by EOY 2025; real-time automated economic dispatch of DER by 2026.



Future Work

- ▶ **Distribution and Transmission Planning**
 - ▶ NWA can be difficult to incorporate into solutions; few deployments of storage as a transmission asset.
- ▶ **DER Aggregation and System Planning**
 - ▶ System planning takes DER as inputs; could be treated as selectable resources.
 - ▶ Ensure distribution and transmission system planning consider net impacts of DERs.
 - ▶ Current pilots are small scale.
- ▶ **Flexible Interconnection**
 - ▶ Potential real-time curtailments of ERIS and provisional generators.
 - ▶ Automation of interconnection study processes.
 - ▶ DER dispatch integration into system operations.

Questions?

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