Distribution Operations & Planning (P200)

2025 Research Summary

Lindsey Rogers
Program Manager
lirogers@epri.com
865.218.8092

Distribution Operations & Planning Program (P200)

Grid Modernization Strategy
Develop and adjust plans

New Resource Integration
Integrate higher levels of DER, ES, EVs

Reliability & Resilience
Maximize improvements per dollar invested

Electrification & Decarbonization
Inform plans to meet targets

Operational Efficiency
Use data, tools, and technology effectively

Workforce Skill Development
Identify new skills required

Leading Practices
Gain insights from utilities across the globe

Enabling utility transition to tomorrow's distribution platform using a **balanced approach** to **grid modernization**.

Planning

Advance the planning tools, methods, and practices needed to realize the modern distribution system

Electrification

Methods & models to assess the impact of changing system conditions & consideration in planning scenarios

Forecasting

Guidance on refined forecasting methods and practices to account for electrification & extreme weather events

System Design Practices

Guidance on design practices for enabling electrification & high penetration DER including ratings, secondary impacts & voltage regulation

Strategic Planning

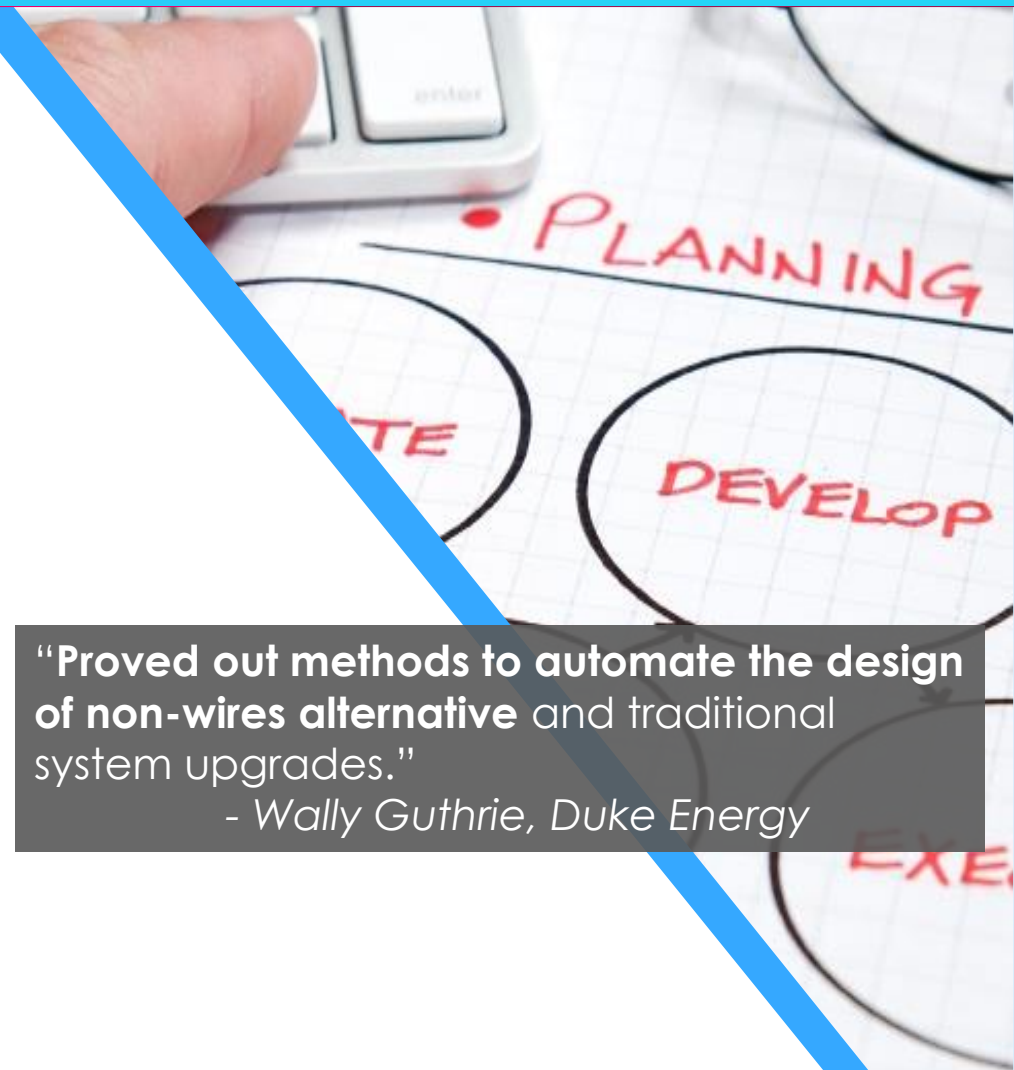
Frameworks for evaluating strategies for cost-effective, reliable and resilient system expansion leveraging flexibilities in new end-use demands

Non-Wires Alternatives

Analytics, tools, and guidance to evaluate NWAs alongside traditional alternatives

Analytics to Support Operational Decisions

Tools to enable planners to assess system configurations & support operator decision making of a more flexible system



"**Proved out methods to automate the design of non-wires alternative** and traditional system upgrades."

- Wally Guthrie, Duke Energy

Planning

2025 Research Projects

Contact: Jouni Peppanen, jpeppanen@epri.com

Deliverable Title	Description
Distribution Planning Guidebook: 2025 Edition	Expansion and revision of guidebook focusing on traditional and modern distribution planning practices and procedures.
Locational Medium- and Long-Term Forecasting Accounting for Electrification	Develop guidance on applying transportation and building electrification forecast information and considering weather and climate change in locational time-series medium- and long-term distribution load forecasting.
The Effect of Reverse Power Flows on Substation Transformer Banks	Develop guidance on reverse power flow impacts on substation transformer banks and associated rating and loading practices.
Planning for Transportation Electrification	Develop guidance on the demand characteristics of non-residential transportation electrification loads and the associated distribution planning practices, methods, and tools.
Project Justification and Portfolio Prioritization	Review industry practices, methods, and tools to identify issues and opportunities in project justification, and the valuation and prioritization of a list of disparate projects and programs within a portfolio.
Staged Solutions to Serve Large Customer Connection Requests	Provide planners with guidance on how to predict when and where large customers are likely to connect to the distribution system as well as potential mitigation opportunities that may provide mutual benefits to the utility and its customer.
Non-Wires Alternatives Workshop	Workshop discussion and collaborating with members on the aspects of planning, implementing, and operating NWA programs.
Strategic Capacity Planning Tool	Develop a software tool to efficiently assess long-term, system-wide, substation- and feeder-level infrastructure needs and opportunities for non-wires solutions.
Voltage Conversion Strategies and Prioritization	Develop methods and guidance for prioritizing and sequencing voltage conversion projects considering loading and capacity, asset condition, and reliability impacts.
Resilience Planning Metrics and Methods	Review and advance resilience planning metrics and methods, considering combined physical infrastructure and societal factors.

Operations

Develop and demonstrate new technologies, tools, and practices to enable DCC staff to meet challenges of today and tomorrow

Advance DMS Applications and Automation

Algorithms to unlock value of DER and manage active system including improvements to existing applications and development of new capabilities

Future DSO Requirements

New processes and tools enable DSO including the new roles/responsibilities required

Operational Visibility

Guidance and analytics to achieve least-cost means for operational visibility using DER forecasting and AMI

Modernizing DCC

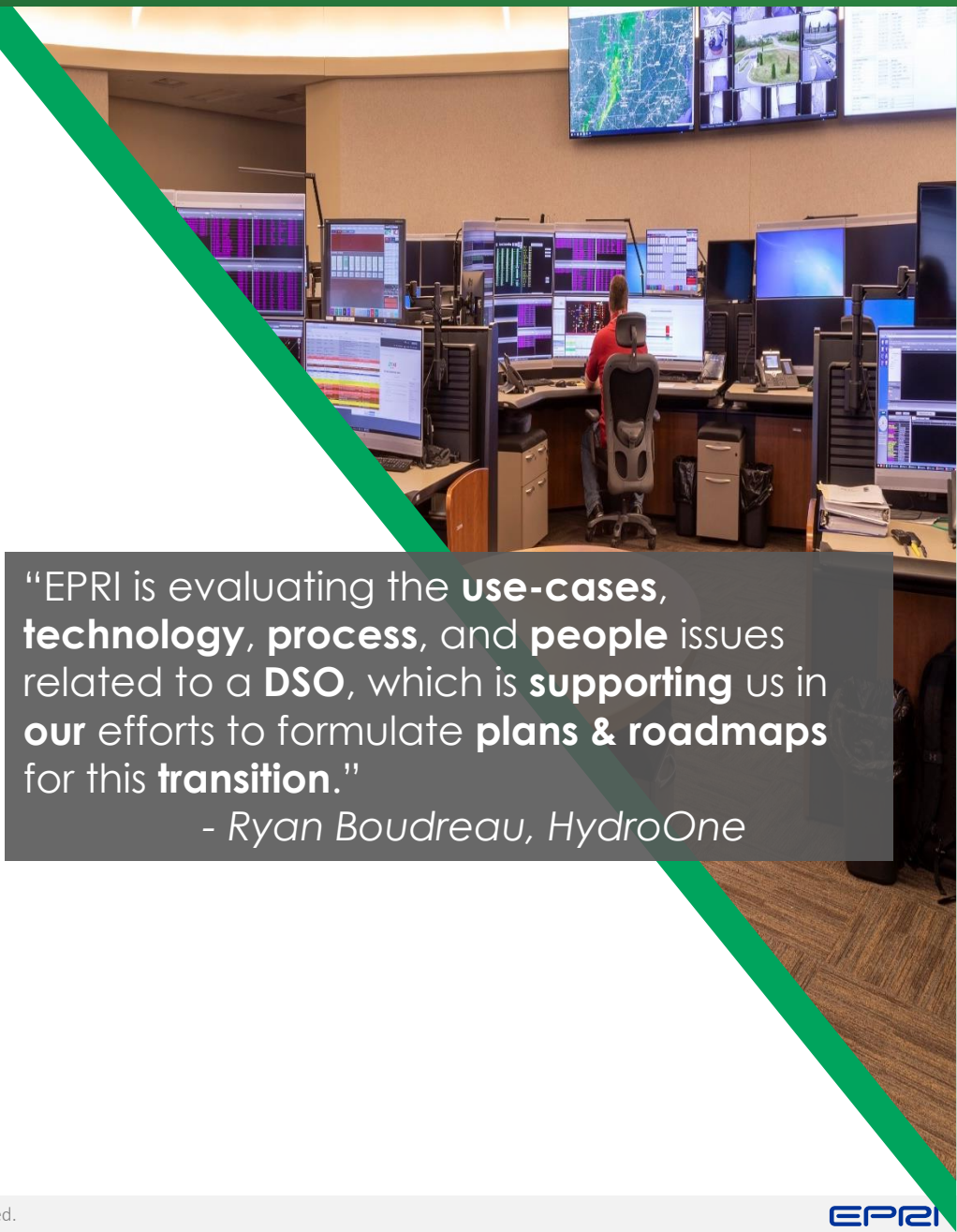
Guidance and leading practices to design and manage a modern DCC including guidance to improve situational awareness

Reliability & Resiliency

Analytics & tools to evaluate reliability improvements and maximize their potential benefits as the system evolves

Future Operator Training

Training and curriculum for DMS applications, alarm management, cyber security



"EPRI is evaluating the **use-cases**, **technology**, **process**, and **people** issues related to a **DSO**, which is **supporting** us in **our** efforts to formulate **plans & roadmaps** for this **transition**."

- Ryan Boudreau, HydroOne

Operations

2025 Research Projects

Contact: Brian Deaver, bdeaver@epri.com

Deliverable Title	Description
Distribution Operations Guidebook	Expansion and revision of guidebook with foundational knowledge relevant to today's DCCs supporting implementation of DA and DMS applications.
Model Readiness for Grid Operations: DMS Model Validation and Verification for Power Flow	Develop and implement methods to validate operational grid models. Demonstrate these methods using test models and synthetic data to ensure that utilities can assess and improve their model quality.
Automated DA Benefits Reporting: Requirements Document	Define OMS & DMS reporting requirements to enable automated DA benefits calculation.
Reliability Planning Methods and Application Guide	Translate recent developments in predictive reliability modeling to actionable recommendations, guidance, and practices.
Advanced VVO Performance Testing and Tutorial	Provide insight into validating the effectiveness of VVO systems through virtualized field testing. By developing a test framework, utilities can use it to evaluate their DMS or provide operator training in conjunction with EPRI's OPS Lab.
DMS Experience Webcast Series	Share lessons learned, leading practices, and success strategies to move the industry forward in deployment of high value ADMS applications.
Distribution Operations with DER Reference Guide	Provide a cohesive, central reference guide of DER impacts and opportunities for distribution operations.
RESILIENCE: Adding Operators to Mutual Assistance Teams	Explore recent experiences with utilities beginning to send operators on mutual assistance teams, to identify early successes, gaps, lessons learned, and the need for new research.
AI Use Cases for Distribution Operations + Demo within DOIG	Develop top AI use cases for the distribution control center in Year 1 and select one (3-part Comms) for demonstration using recordings supplied by DOIG members.
On demand training / operating instructions	Adapt a mobile application developed to support field crew and DCC operator interactions.

Protection

Develop new methods for protecting the modern distribution grid & take advantage of new capabilities made available through grid modernization

Automated Protection Analysis

Tool to automatically perform protection studies, identify credible protection issues, propose changes to fusing or recloser settings to mitigate issues

Guidance for Mitigation Impacts of DER on System Protection

Guidance for modeling DER and load in protection studies as well as guidance to mitigate impacts. Roadmap for protection utilities to protect the grid of the future

Microgrid Protection

Guidelines for safe and cost-effective microgrid protection design

Application of IEC 61850 and Centralized Protection to Distribution Substations

Primer on how IEC61850 is deployed in substations and how configuring, commissioning, and maintenance practices may change. Overview of centralized protection

Protection Training

Computer-based training modules to provide an introduction to distribution protection covering topics like coordination, fuse/trip saving, reclosing, cold load pickup and others

Operations Related Protection Practices (Hot Line Tag)

Detail common terminology, practices including lead times, processes, peer checks, reaction to events, post storm field inspections, field crew involvement, recloser over reach and alternate configuration

"DPAT **enabled PPL** to **successfully identify** and **prevent** a **misoperation** and **improved engineering** analysis **time**"

- Mychal Kistler, PPL

Protection

2025 Research Projects

Contact: Aadityaa Padmanabhan, apadmanabhan@epri.com

Deliverable Title	Description
Distribution Protection Analysis Toolkit (DPAT) for CYME	Develop a tool to automatically perform protection studies across multiple scenarios, identify credible protection issues, propose changes to fusing or recloser settings to mitigate issues.
Distribution Protection Analysis Toolkit (DPAT) Synergi	Develop a tool to automatically perform protection studies across multiple scenarios, identify credible protection issues, propose changes to fusing or recloser settings to mitigate issues.
Protection Data Management	Work with utilities, vendors to identify gaps in existing practices; roadmap to better integrate systems. Work to improve protection data management; sharing of data between users, repositories, tools.
DER Modeling for Short Circuit and Protection Studies	Develop reference guides presenting inverter-based and rotating DER short circuit characteristics. Understand DER model behavior in simulation tools and provide guidance on appropriate modeling techniques for various short circuit studies.
DER Protection Issues Working Group	Understand protection screening and deployment challenges associated with DER deployment on distribution circuits.
Energized Downed Conductor Detection Technologies	Test high impedance fault detection techniques introduced by relay vendors and determine their efficacy.
Recloser with Ground Switch – Alternative to DTT	Investigate the use of shorting systems as an alternative to DTT thereby using the DER controller to bring the plant offline.
Distribution Protection Guidebook	Develop a guidebook focusing on traditional and modern distribution protection practices and schemes.
Analysis of Reclosing Practices for Improved Reliability & Safety	Develop metrics and techniques to identify optimal protection and reclosing strategies for the most efficient operation of the distribution system following temporary and permanent faults.

Analytics

Modernize grid modeling, use of available data streams, and wide-area assessments for effective and efficient engineering analytics.

Enhanced Grid Modeling

Improve distribution grid models and the processes to develop them to meet the needs of operations and planning engineers.

Utilizing Measurement Data

Enable utilities to fully leverage new and existing data to support distribution planning and operations decisions.

Wide-Area Distribution Assessments

Develop tools and analytics to enable effective and efficient analysis of wide area grid impacts from electrification, decarbonization, extreme events, etc.

"Rapid load and DER growth resulting from decarbonization and electrification in Seattle demands a modern distribution grid in a way that is a massive data-generating and data-processing machine. From customer-facing load/generation interconnections to back-end real-time dynamic operations, this machine is sensitive to data and model quality, and the level of integration of the data workflow. EPRI's idea of having a **dedicated data management and model maintenance** engineer to efficiently address all these dependencies shared by different groups across the organization is proven brilliant at City Light."

- Kincheiu Wei, Seattle City Light

Analytics

2025 Research Projects

Contact: Matthew Rylander, mrylander@epri.com

Deliverable Title	Description
Grid Modeling Guidebook	Provide guidance on grid modeling detail and formatting required for various applications and assessments in operations and planning.
Grid Modeling Applications | Improved Phasing	Develop and demonstrate methods to improve the phasing of grid models.
Grid Modeling Workshop | CIM Training	Provide basic CIM tutorial for planners and operators covering Dx feeder modeling with the CIM, XML serialization.
Measurement Data for Grid Modeling Guidebook	Provide methods to clean, structure, and make measurement data easier to utilize in planning and operational studies.
Measurement Data for Grid Applications | Adequate Sensing for Grid Observability	Examine and provide methods/guidance to determine required sensor data to improve system observability.
Measurement Data Workshop | Acquisition to Application	Brings together teams responsible for data acquisition and utilization to provide better understanding of meter data, issues, and applications.
Hosting Capacity Guidebook	Further refine guidance on how to perform and apply hosting capacity results.
WADA Applications | Considering Reconfiguration in Planning	Examines wide area distribution assessment methods to account for alternative (N-1) conditions to support planning decisions.
WADA Workshop | Automation Through Scripting	Provide computer-based tutorial focused on conducting Python-driven power flow analytics in vendor tools to support interconnection and planning studies.

Technology Transfer

Provide high-impact resources that cover topics relevant to distribution operations, planning, and protection and keep members up-to-date on the latest industry issues.

Engagement and sharing among members

Forums to discuss planning and operations **practices**

Knowledge transfer resources related to grid modernization

Periodic updates on topics of interest

Deliverable Title	Description
Grid Modernization Playbook: 2025 Update	Furthers a framework to help utilities develop strategies to meet the evolving requirements of a modern grid including how it can be applied to develop company-specific strategies for grid modernization.

"The **Grid Mod Playbook** saved time in creating an initial grid modernization roadmap and showing alignment between organizational goals and engineering projects"
- Uzma Siddiqi, Seattle City Light