

AT A GLANCE

Distributed Energy Resources Integration

Program 174



RESEARCH VALUE

- Supports and accelerates the safe and efficient integration of DER while also increasing system reliability to benefit all system users. Leverages primary research and industry partnerships to provide practical tools and identify best practices for DER integration. .

MEMBER BENEFITS

Apply research results, tools, methods, and resources to:

- Design and update systems and infrastructure to meet DER integration goals.
- Determine requirements and take advantage of evolving standards for DER interconnection.
- Analyze DER integration issues and make decisions about levels, settings, and types of DER.
- Develop strategies for managing and integrating customer sited DER.
- Assess both technical and economic aspects of DER integration with existing distribution assets.
- Train staff on integration technology for smart inverters, grid edge devices, control systems, and more.

EPRI's Distributed Energy Resources Integration program addresses technical and economic challenges to the integration of distributed solar, battery storage, and other distributed energy resources (DERs) on the distribution system. Managing and screening interconnection requests, modeling and analyzing grid impacts, specifying grid-support functions and settings, and applying monitoring and control systems are among examined issues. The program covers analytics, devices, management, control, and practices for effective integration of DER. It moreover addresses the economics, business risks, and tradeoffs for providing reliable service with increasing DER deployment levels.

All projects aim to provide industry leadership and often build on previous work related to DER integration. Distribution system analysis, hands-on product evaluations, DERMS, business practices, strategy and cost-benefit analysis are key elements to the research, including assessment of non-wires alternatives (NWA) and optimizing solar PV operation with storage and controllable loads.

“ *Southern Company has benefitted tremendously from research, webinars and workshops EPRI has conducted in the area of DER Integration.* ”

~ Georgia Power Company

Key Activities for 2023

RESEARCH PORTFOLIO

P174A: Grid Impact Analysis of DER

DER modeling and simulation are essential to understand and predict the impacts of DER under various grid operating conditions. This project set provides engineers with methods and guidance for operating and planning with a wide range of DER types (PV, Storage, EV charging management, etc.) and penetration levels. The project set provides insights to grid impacts, potential benefits, and how to accommodate more autonomous and managed DER without sacrificing safety, reliability, or effectiveness.

P174B: Smart Inverters and Grid Support Technologies

This project set provides an in-depth understanding of solar PV, energy storage, and vehicle-to-grid (V2G) smart inverters, grid forming inverters, power control systems (PCS), and other emerging grid-edge voltage regulation technologies. Activities include laboratory and field testing of DER technologies to characterize their steady-state, dynamic, and transient behaviors, controls and protections, and grid support capabilities and use the learnings to develop accurate models. Several tutorials and workshops are organized to increase member understanding of these technologies and leveraging full potential of their capabilities.

This project set aims to advance the state of DER technologies by providing industry leadership to define the next generation of DER grid support functionalities.

P174C: DERMS and Microgrid Integration

This project set supports utilities understanding the value of DERMS, its architecture, procurement, deployment strategy, integration, and operation. Deliverables include DERMS requirements and specifications, up-to-date information about technology capabilities by conducting laboratory testing and field demonstrations, breakthroughs and lessons learned from DERMS projects worldwide, as well as tools and test procedures to carry out independent evaluations of DERMS. The project set also addresses challenges in coordination between TSOs, DSOs and DER aggregators when DER are managed to provide bulk system services.

P174D: Practices, Programs, and Economics

This research informs utility efforts to manage DER more efficiently on distribution and enhance strategic planning. Activities help streamline utility interconnection and operational practices to reduce costs while maintaining grid safety and reliability; provide guidance on the economic implications of scenario-based DER integration approaches, including advanced inverter functions under different DER rate structures and interconnection terms; and qualify utility DER business models, programs, and procedures, including those governing NWA projects as well as DER for grid services offerings.

P174E: Technology Transfer and Industry Engagement

The objective of this research is to deliver practical DER integration knowledge and enable members to share DER experience, issues, and solutions. Utility staff can immediately apply this knowledge to improve distribution system design, screening, troubleshooting, and safety practices relative to distributed generation.

SUPPLEMENTAL PROJECTS

Opportunities for program members beyond the annual research portfolio include:

- [Software Tool for DER Settings Files](#)
- [DER Systems of Record to Support Enterprise-Wide Applications](#)
- [Islanding Prevention Risk Assessment Tool \(IPRAT\)](#)
- [Model-Based Analysis of DER Functions and Settings](#)
- [Utilizing DER for Advanced Distribution Resiliency](#)
- [Making DER Connections in Low Voltage Networks](#)
- [Field Validation Tool for Smart Inverter Configuration and Settings](#)
- [Inverter-Based DER Dynamic Response Characterization for Protection, Planning, and PQ](#)

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