



## 2026 Research Portfolio

### P174 – DER Integration

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#### Program Description

The DER Integration Program develops solutions to help utilities address the challenges of integrating increasing levels of distributed energy resources (DERs) – including solar photovoltaic (PV), battery energy storage (BES), electric vehicle (EV), and others – into distribution systems. The program spans a wide range of technical and operational topics, such as updating technical interconnection requirements (TIRs), assessing hosting capacity, improving interconnection screening methods, reviewing best practices for grounding, protection, and metering, modeling and analyzing grid impacts of grid-following and grid-forming DERs; selecting and configuring smart inverter grid-support functions and settings; applying DER Management System (DERMS) for monitoring and control, and designing utility-scale and community microgrids. Additionally, the program explores the economic opportunities and challenges of delivering reliable grid services through non-traditional approaches and programs – including non-wires alternatives (NWA), virtual power plant (VPP), and flexible interconnection, all aimed at maximizing the value of high DER penetration.

#### Approach

The program's research is conducted with strong member engagement through regular webcasts, workshops, tutorials, and the delivery of results in accessible, easy-to-apply formats. It focuses on developing practical tools and guides that utilities can use in day-to-day planning and operations. Research activities span a wide range of methods, including modeling and analysis, laboratory testing, field evaluations, software development, data analytics, industry surveys, standards-support, and facilitation of working/interest groups. Each project is designed to provide industry leadership and timely, actionable insights that help utilities prepare for evolving technical and regulatory landscapes.

The activities are organized in five project sets, each addressing specific research efforts and deliverables:

- Grid Impact Analysis of DER
- Smart Inverter and Grid Support Technologies
- DERMS and Microgrid Integration
- Practices, Programs, and Economics
- Technology Transfer and Industry Engagement

#### Research Value

The knowledge acquired through this research program will support members to:

- **Support informed decision-making** on smart inverter settings and control strategies to increase hosting capacity for diverse DER types.

- **Streamline interconnection processes** by managing queues efficiently and applying effective screening methodologies.
- **Facilitate the adoption of industry standards** that promote safe and efficient DER integration into utility operations.
- **Technical support of regulatory activities** that improves stakeholder understanding of technical issues and avoids future system reliability concerns.
- **Proactively detect and resolve grid challenges** arising from increasing DER penetration.
- **Enable holistic system planning** to accommodate PV, storage, EVs, and flexible loads in future infrastructure designs.
- **Leverage evolving interconnection standards** to define technical requirements and ensure compliance.
- **Build workforce expertise** through comprehensive training on DER integration, including smart inverters, modeling and analysis, DERMS, and economic analysis.
- **Develop integration strategies** for customer-sited DERs and microgrids to enhance grid flexibility and resilience.
- **Evaluate technical and economic impacts** of DER integration on existing distribution infrastructure.
- **Apply data analytics** to assess DER performance, operational costs, and value contributions.

### Key Activities

In 2026, this program expects to accomplish the following:

- Maintain member awareness of latest technologies, best practices, and emerging business opportunities related to DER.
- Conduct tutorials, workshops, webinars, and discussion forums on current DER integration topics.
- Conduct laboratory and field evaluations of DER technologies and DERMS.
- Provide reinforcement learning based tool and method for choosing smart inverter settings.
- Investigate technologies to improve control in grids and microgrids, and accommodate higher penetrations of DER.
- Address interconnection challenges of grid-following inverters on weak grid conditions.
- Develop performance requirements and distribution system impacts of grid-forming inverters.
- Advance the phasor- and EMT-domain DER models for more accurate analysis of DER impacts and benefits of smart inverters.
- Application of LLM-based AI tools to simplify DER interconnection application and screening processes, providing methods to streamline and automate where appropriate.
- Define/document DERMS requirements and implementation approaches, perform DERMS control method evaluations, and support DERMS integration with aggregators.
- Develop guidance on how to develop utility programs and practices that leverage DERs for grid flexibility services.

### Accomplishments

The DER Integration program has delivered valuable tools and resources to members and industry. Examples of recent program outcomes:

- Developed the analysis methods for performing DER hosting capacity and continues to support advances in hosting capacity modeling.
- Led the development of smart inverter grid support functions that were implemented as a part of state requirements in California and Hawaii and also the IEEE 1547 standard.
- Developed standard communication protocols and interfaces with DER to facilitate DER management.
- Supported utilities with the adoption of IEEE 1547-2018: provided over 100 recommendations for enhancing DER interconnection practices and protocols relevant to application management,

technical reviews and utility internal infrastructure.

- Actively engaged in ongoing IEEE 1547 revisions of the base standard and related recommendations and guides.
- Developed comprehensive guidelines on DER modelling for various planning studies.
- Provided tools and guidelines for selecting smart inverter functions and settings.
- Developed IEEE 1547-2018 compliant white-box battery energy storage and solar PV inverter EMT models.
- Applied the DER Integration Testbed to successfully test commercial DERMS and to develop improved DER control algorithms. Provided reference RFP language for DERMS.
- Critically assessed and provided recommendations related to DER power system phenomena such as harmonics, grounding, ground fault overvoltage (GFOV), open phase, and islanding.
- Performed detailed hands-on evaluation of steady state and dynamic behaviors of PV and energy storage smart inverters.
- Developed a streamlined method for finding locations within a distribution feeder that benefits and draw value from DER-based non-wired alternatives.
- Addressed DER unique protection issues by providing specific recommendations for neutral grounding, open phase detection, transformer inrush, flicker, harmonics, and unintentional island prevention.
- Developed and applied a cost-benefit analysis method for determining value for a range of program designs, including the use of advanced grid support functions to accommodate higher penetration of DERs and flexible interconnection curtailment.
- Established the DER Forum, which enables members to bring up DER integration questions and receive responses from utility peers and EPRI staff.

### Estimated Funding

\$8.0M

### PS174A: Grid Impact Analysis of DER

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### Objective

As DER penetrations to the distribution grid increase, DER modelling and simulation are essential to operators and planners to fully understand and predict the impacts and capabilities of DER under various grid operating conditions. Awareness of new and evolving study methods will enable them to maintain and/or improve overall customer service while maximizing asset utilization. This project set provides engineers with methods and guidance for operating and planning feeders with a wide range of DER types (PV, Storage, EV, etc.) and penetration levels.

Key research questions are:

- What is the best way to determine how much DER my distribution system can accommodate?
- What are the key characteristics of DER needed for accurate feeder modeling?
- What are the key protection issues for high penetrations of DER?
- How do I model the steady state, dynamic, and transient behavior of inverters on distribution systems?

- How do I assess power systems issues, such as grounding, with high penetrations of DER?
- How can I advance my planning and operational analysis capabilities to interconnect DER aggregations (FERC O2222)?
- How is hosting capacity affected by DER advanced functions (IEEE Std 1547-2018™ or similar), and what are the best DER functions and settings for specific applications?
- What are the practical guidelines for making proactive changes to my study practices related to DER as penetration levels grow?
- How can managed control of DER help to provide local distribution services and improve system reliability?
- How can DER be coordinated with traditional equipment (line voltage regulators, load tap changers, capacitor banks, etc.) to achieve an objective?

This project set addresses these questions and delivers insights into grid impacts, potential benefits, and strategies for integrating more autonomous and managed DER without compromising safety, reliability, or operational effectiveness. Participating utilities can contribute to and benefit from the development of methods, software tools, and guidelines that address a broad spectrum of DER considerations—from identifying the best autonomous functions and settings to evaluating system grounding with inverter-based resources.

### Approach

This project set is carried out through power system studies using a range of modelling and simulation tools including steady state, dynamic, and Electromagnetic Transient (EMT) analysis. Research focuses on the best autonomous functions/settings and cost-effective DER management techniques to facilitate further integration of DER. Where possible, actual circuits of participating utilities are used in the studies, and results are designed to apply to a diverse set of circuit types. Results are provided in the form of guidelines and software tools that can be easily applied by engineers for a variety of applications. Through the Accelerating Commercial Engagement (ACE) plan, this project set contributes to and coordinates findings with standards organizations and commercial vendors so that results move effectively from the research realm to the marketplace, bringing products and support to address pressing issues. Strong utility engagement is encouraged through frequent webinars and meetings focused on obtaining feedback, guidance, and knowledge sharing.

### Research Value

The proposed Grid Impact Analysis of DER research is expected to produce the following values and outcomes:

- **Keep pace with rapid technology evolution** by updating analysis methods.
- **Save time and cost** in determining and configuring DER settings and functions to meet an objective.
- **Increase hosting capacity, grid utilization, and economic efficiency.**
- **Awareness of fundamental interconnection technical challenges** through tutorials, workshops, and written reports/guides on simplified assessment approaches.
- Access to enhanced tools and methods that automate studies and **produce proven distribution analysis results.**
- **Understand complex, transient DER operations** by investigating dynamic control interactions associated with autonomous DER operations.
- **Informed and streamlined interconnection processing** through more accurate and thorough engineering practices.
- **Deliberate coordination and evaluation of DER grid services** from individual and aggregate DER with enhanced planning and analysis methods.
- Gain access to and exchange **industry trends, state-of-the-art developments, and lessons learned** from other distribution utilities.
- Advance industry knowledge in the application of advanced DER models for distribution analysis.
- Identification of the key challenges facing higher penetration levels of DER.
- Support company road-mapping with knowledge, perspective, and new ideas about what future distribution systems with significant levels of DER, smart inverters, and automation will need to operate

economically and efficiently.

**Anticipated Deliverables**

Deliverable	Value	Date
<p><b>DER Grid Impacts Analysis Workshop:</b> Session at EPRI advisory meetings in September to allow utilities to share, benchmark, guide, and brainstorm study methods, results, and documentation.</p>	<ul style="list-style-type: none"> <li>• Improve utility DER study accuracy and efficiency</li> <li>• Engage utility peers to identify, learn or develop innovative DER study methods</li> </ul>	<p>September 2026</p>
<p><b>DER Grid Impacts Analysis Tutorial (Overview):</b> Provide a tutorial for distribution planners and DER integration engineers on key grid issues that arise when DER interconnects with radial distribution systems.</p>	<ul style="list-style-type: none"> <li>• Improved operations through training on DER grid impacts on fundamental operating practices</li> <li>• Foster innovation and technical excellence by introducing tools for efficient grid analysis</li> </ul>	<p>August/Q3 2026</p>
<p><b>DER Grid Impacts Analysis Tutorial (Case Study):</b> Build on an overview tutorial for distribution planners and DER integration engineers by showing a realistic series of actual impact study methods.</p>	<ul style="list-style-type: none"> <li>• Enhance practical skills with real-time, hands-on training</li> <li>• Improve DER integration efficiency through advanced training methods</li> </ul>	<p>November/Q4 2026</p>
<p><b>Assessing the Technical and Economic Opportunity of Energy Storage under Flexible Interconnection (NY Case Study):</b> Develop method to analyze BESS operation under FICS to determine how multiple DER operate together when subject to technical, financial, and policy considerations. Demonstrate in modeling and simulation case studies. Outline considerations for cost-benefit analysis.</p>	<ul style="list-style-type: none"> <li>• Improve feeder hosting capacity and operation of energy storage through flexible interconnection</li> <li>• Achieve improved value stacking of BESS resources using awareness of time-varying hosting capacity and charge/discharge rates</li> </ul>	<p>December 2026</p>
<p><b>Smart Inverter Setting Optimization via Reinforcement Learning:</b> Develop a reinforcement learning based neural network agent that can 1) optimize autonomous default DER settings 2) optimize location-specific time-varying DER settings that can be dispatched in real-time.</p>	<ul style="list-style-type: none"> <li>• Reduced O&amp;M through efficient DER settings selection, using real grid data</li> <li>• Reduction in trial and error of DER settings</li> <li>• Automation of applied settings</li> </ul>	<p>December 2026</p>
<p><b>Agentic AI for Power System Study Automation:</b> Develop agentic AI solution to automate DER interconnection screening and grid impact studies. Integrate standardized LLM APIs (e.g., GPT), with grid planning tools such as CYME and PSCAD, leveraging expert support informed by EPRI research and utility documentation. <a href="#">Proposed joint deliverable with P174B.</a></p>	<ul style="list-style-type: none"> <li>• Significantly reduce time and manpower required for DER interconnection and related studies</li> <li>• Improve study accuracy and minimize human error</li> </ul>	<p>December 2026</p>
<p><b>Utility Microgrid Assessment Guide (4<sup>th</sup> Edition):</b> Update the 2023 guidebook with refined performance indices, design flowcharts, and real-world assessment examples using the VIPER study method to support more effective microgrid planning and evaluation.</p>	<ul style="list-style-type: none"> <li>• Accelerate and improve microgrid planning by using a clear, step-by-step framework</li> </ul>	<p>December 2026</p>

	<ul style="list-style-type: none"> <li>• Increase confidence in microgrid viability and protection strategies through refined assessment processes</li> </ul>	
<p><b>T&amp;D Coordination of DER Settings to Improve System Reliability (2026 Edition):</b> Develop knowledge and study methods for selecting and tuning DER settings that ensure seamless coordination between transmission and distribution systems, with the goal of maintaining or improving overall grid reliability. <a href="#">Proposed joint deliverable with P173, P40.</a></p>	<ul style="list-style-type: none"> <li>• Enhance grid reliability by optimizing DER settings, reducing disruptions and maintenance costs.</li> <li>• Improve utility satisfaction rankings through proactive DER coordination, ensuring seamless T&amp;D integration.</li> </ul>	December 2026
<p><b>Behind the Meter Energy Management System - Considering Co-located Generation, Storage, DR Markets:</b> Energy management system for an electric bus depot. Consider factors like co-located generation, energy storage, and demand responsive schemes. Realistic EV fleet operation and site limitations for medium term scheduling (hourly, week-ahead). <a href="#">Proposed joint deliverable with P174C.</a></p>	<ul style="list-style-type: none"> <li>• Optimize fleet charging operations, reducing energy costs and enhancing network stability.</li> <li>• Enable participation in demand response markets, increasing operational flexibility and revenue opportunities.</li> </ul>	December 2026
<p><b>Practical Considerations for DER Aggregation (DERa) Services, Siting, and Control:</b> This project will develop practical methods and tools to characterize, study, and coordinate DER aggregations, enabling utilities to revise interconnection and operational practices for improved grid reliability and service integration.</p>	<ul style="list-style-type: none"> <li>• Reduce risk of unanticipated grid impacts by distinguishing DERa from individual DER in interconnection and operational studies.</li> <li>• Supports informed operational and planning decisions through tools that estimate DERa generation capabilities at the feeder level.</li> </ul>	December 2026
<p><b>Value of Network Model Accuracy on DERMS Performance (Tech Update):</b> In a world of flexible DER management, DERMS will calculate system needs and convert them into DER dispatch settings for reliable and safe grid operations. However, DERMS may not have the most accurate data and models to perform such calculations. The project will explore the accuracy in network model, DER monitored and forecasted data that are essential to calculate dynamic operating envelopes for DERMS. <a href="#">Proposed joint deliverable with P174C.</a></p>	<p>Helps utilities understand the sensitivity of DERMS decisions to network data quality. Informs investment in monitoring, forecasting, and model validation to improve DERMS performance.</p>	December 2026

Past EPRI Research on Topics

Product ID	Title	Description	Published Date
<a href="#">3002029106</a>	Considering the Equitable Allocation of DER Hosting Capacity	Portray conflicts between DER policy goals and technical, reliability objectives, and develop and model real-world scenarios.	2024
<a href="#">3002026666</a>	DER Modeling Recommendations and Guidelines for Distribution System Assessments: 2023 Edition	Comprehensive guidelines on DER modelling for various planning studies.	2023
<a href="#">3002029077</a>	DER Secondary Analysis Toolkit (DSAT)	A convenient tool to help utilities evaluate DER impact in secondary circuit.	2023
<a href="#">3002028113</a>	Developing Time-Varying Operating Envelopes to Inform DER Dispatch	A framework to help address the challenges DSO and utilities face when taking grid services provided by DER aggregators	2023
<a href="#">3002030784</a>	Guide to Protection of Microgrids	An overview of protection design approaches for common types of utility-owned microgrids.	2023
<a href="#">3002028554</a>	Interconnection Analysis Methods for Mixed DER and Export Limited DER	A thorough evaluation of feeder operation considering steady state voltage, equipment thermal ratings, protection, and voltage fluctuations.	2023
<a href="#">3002019323</a> <a href="#">3002021725</a> <a href="#">3002024176</a> <a href="#">3002026669</a> <a href="#">3002031150</a>	Simplified Methods for Determining Smart Inverter Functions	Updated application guidelines with lessons learned from field experience, as well as additional functions, and modelling scenarios.	2020, 2021, 2022, 2023, 2024
<a href="#">3002019325</a> <a href="#">3002021726</a> <a href="#">3002024197</a>	DER Autonomous Function and Settings Assessment (DAFSA) DRIVE Module	A software tool that works with commercial power flow software to assess the best universal autonomous functions and settings for DER.	2020, 2021, 2022
<a href="#">3002021727</a>	Feeder Settings Analysis Calculator (FSAC)	Excel-based, simplified feeder analysis tool for assessing the voltage impacts of DER operating with volt-var and/or fixed power factor control.	2021

<a href="#">3002022649</a>	Inverter-based Supplemental Grounding Tool (ISGT) V2.0	A tool that enables engineers to evaluate the need for a ground source to mitigate ground fault overvoltage associated with inverter-based resources. Allows for sensitivity on several key parameters to enable confident selection of a ground source.	2021
<a href="#">3002021728</a>	Impact of Autonomous DER Functions on Centralized Voltage Optimization: Additional Smart Inverter and PV Scenarios at Fine Granularity	Evaluate the impact of high DER penetration on a feeder comparing local voltage regulation control settings versus a centralized voltage optimization (VO) scheme, without and with selected DER grid support functions.	2021

**Related Research**

Coordinated with and complements the work undertaken in Bulk Power System Integration of Variable Generation (P173), Energy Storage and Distributed Generation (P94), and Distribution Operations and Planning (P200).

**PS174B: Smart Inverter and Grid Support Technologies**

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**Objective**

This project set provides an in-depth understanding of smart inverter, power plant controller (PPC), power control systems (PCS), microgrid interconnect device (MID), emerging grid-edge voltage regulation technologies like low- and medium-voltage STATCOM, and relevant industry standards for safe, reliable, and economic grid interconnection of distributed energy resources (DERs) including Solar Photovoltaic (PV), Energy Storage (ES), and electric vehicle (EV). Research in this project set can be grouped into three focus areas.

**Focus Area I: Technology Evaluation**

This area focuses on lab and field evaluation of smart inverters and grid support technologies to characterize their steady-state and dynamic performance. Key objectives include assessing how accurately commercial inverters comply with interconnection standards such as IEEE 1547-2018, evaluating their behavior during grid faults, and identifying the grid support capabilities offered by modern grid-following and grid-forming inverters. Comprehensive assessment of DER technologies supports optimal utilization of their capabilities while addressing operational challenges. Hands-on experience with DER technologies is leveraged to support the development and validation of steady-state and electromagnetic transient (EMT) models, created by EPRI and commercial tool developers.

**Focus Area II: Model Development and Verification**

This research area aims to support the development of accurate DER models and enable efficient analysis using those models. Key questions include: How can we ensure that models in steady-state and dynamic/transient simulation tools accurately represent real hardware behavior in the field? What are the best practices for verifying

model accuracy? When are detailed EMT studies necessary? And how can artificial intelligence (AI) be leveraged to automate model quality checks, assess DER conformity to standards, and evaluate system impacts? In addition, simulation studies are conducted with validated DER models to evaluate DER response under a range of grid conditions, including unintentional islanding, open phase, load rejection, and ground faults.

**Focus Area III: Advancing Technology Utilization**

This research area focuses on evaluating the grid value and developing technical requirements for new and emerging technologies that support DER integration. Key questions include whether high penetrations of inverter-based resources could lead to grid instability or power quality issues, what mitigation strategies are available, and what the use cases, performance requirements, and potential drawbacks of emerging grid-forming inverters are—both in microgrid settings and during normal ("blue-sky") grid operations. Research in this area supports the transition toward an inverter-dominated power grid and helps utilities adopt new and advanced technologies in a reliable and informed manner.

**Approach**

This project set conducts hands-on laboratory and field evaluations of technologies including solar PV, energy storage, vehicle-to-grid systems, power plant controllers (PPCs), power control systems (PCSs), and grid-edge voltage regulation solutions. It develops steady-state and transient DER models and performs analyses to identify the needs and value of emerging technologies and capabilities. This project set also facilitates peer-to-peer knowledge sharing through workshops and offers a variety of tutorials to advance utility workforce development.

**Research Value**

This project set is expected to deliver the following key outcomes and value:

- Improved understanding of inverter control, protection, grid support capabilities, and limitations to enable effective integration and optimal utilization of DERs
- Objective, vendor-neutral assessments of PV, ES, PV plus ES, and V2G inverters
- IEEE 1547-2018 ready inverter model specifications and open-source code, vetted by an industry user group, with model validation through laboratory and field testing
- Validated white-box EMT inverter models to evaluate DER plant responses to grid disturbances such as open phase, unintentional islanding, and load rejection
- Recommendations for DER grounding, screening, and commissioning practices
- Verification frameworks for steady-state and EMT black-box inverter models
- Use cases, performance requirements, and distribution system impacts of grid-forming inverters for both microgrid applications and future inverter-dominated power systems
- AI-based tools to automate DER model quality checks, conformity assessments, and system impact studies

**Anticipated Deliverables**

Deliverable	Value	Date
<p><b>AI Assisted DER EMT Screening, Model Quality Check, and Verification (Software-Beta):</b> Develop an LLM-powered agent that aims to automatically conduct DER EMT screening, model quality check, and model verification. The agent will recommend whether an EMT study is warranted and flag any model quality issues.</p>	<ul style="list-style-type: none"> <li>• Accelerate DER interconnection reviews by pre-screening EMT analysis needs</li> <li>• Significantly reduce engineering effort compared to manual EMT model quality check and verification</li> </ul>	<p>December 2026</p>
<p><b>Automated Conformity Assessment of DER Plant Design (Software-Beta):</b> Develop an EMT simulation-</p>	<ul style="list-style-type: none"> <li>• Standardize conformity assessment of DER plant</li> </ul>	<p>December 2026</p>

<p>based framework and toolkit to automate the conformity assessment of DER plant design with IEEE 1547-2018 standard and utility specific interconnection requirements.</p>	<p>design and significantly reduce manual efforts in interconnection reviews</p> <ul style="list-style-type: none"> <li>• Proactive detection of non-conforming plant design before interconnection approval</li> </ul>	
<p><b>Agentic AI for Power System Study Automation and Support (Software-Beta):</b> Develop agentic AI solutions to automate DER interconnection screening and grid impact studies. Integrate standardized LLM APIs (e.g., GPT) with grid planning tools such as CYME and PSCAD, leveraging expert support informed by EPRI research and utility documentation. <a href="#">Proposed joint deliverable with P174A.</a></p>	<ul style="list-style-type: none"> <li>• Significantly reduce the time and manpower required for DER interconnection and other studies</li> <li>• Improve study accuracy and minimize human error</li> </ul>	<p>December 2026</p>
<p><b>Power Plant Controller (PPC) Evaluation (Tech Update):</b> Comprehensive laboratory evaluation of PPC, focusing on its ability to coordinate multiple PV and energy storage inverters inside a DER plant, and effectiveness in satisfying plant compliance at PCC.</p>	<ul style="list-style-type: none"> <li>• Deep understanding of PPC design and operation</li> <li>• Enhance the interconnection requirements and verification process for large-scale DER plants with PPCs</li> </ul>	<p>December 2026</p>
<p><b>Grid-Forming DERs for Inverter-Dominated Power System (Tech Update):</b> Assessing the benefits and impacts of grid-forming (GFM) DERs and developing performance requirements to address challenges in inverter-dominated power systems.</p>	<ul style="list-style-type: none"> <li>• Enhance grid stability and power quality in inverter-dominated power systems</li> <li>• Comprehension of the benefits and challenges of GFM DERs</li> <li>• Establish detailed performance requirements for GFM DERs</li> </ul>	<p>December 2026</p>
<p><b>Tutorials on Grid Following (GFL) and Grid Forming (GFM) Inverter Fundamentals, Grid Support Functions, Standards, Modelling, and EMT Analysis (Online and In-person Tutorials):</b></p> <ul style="list-style-type: none"> <li>• Inverter Fundamentals and Grid Support Functions (8 hours; online and in-person at utility facilities)</li> <li>• Inverter Modelling for Dynamic, Transient, and Protection Analysis (4 hours; online)</li> <li>• DER Electromagnetic Transient (EMT) Modelling and Analysis (EMT) (12 hours; online)</li> <li>• Grid-forming Inverter (4 hours; online) – <a href="#">Proposed joint deliverable with P173A.</a></li> </ul>	<ul style="list-style-type: none"> <li>• Continued workforce development for in-depth understanding and efficient utilization of GFL/GFM DER technologies to improve system performance and reliability</li> <li>• Develop in-house capability and reduce dependency on external resources</li> </ul>	<p>November 2026</p>
<p><b>10<sup>th</sup> Annual EPRI Smart Inverter Workshop (Workshop):</b> This utility only three day in-person event enables peer-to-peer knowledge sharing and</p>	<ul style="list-style-type: none"> <li>• A platform to foster peer-to-peer information sharing</li> </ul>	<p>October 2026</p>

conversations to better understand challenges and potential solutions to adopt smart inverters and IEEE 1547-2018 standard.	<ul style="list-style-type: none"> <li>Lessons learned from various smart inverter PV, ES, EV, microgrid demonstration projects</li> </ul>	
<b>Tech Brief Series on Frequently Asked Questions (Tech Briefs):</b> Create a series of short, easy-to-understand informational briefs addressing frequently asked questions and concerns about DER technologies.	<ul style="list-style-type: none"> <li>Helps convey complex technical topics to upper management and external stakeholders efficiently to facilitate informed decision making</li> </ul>	December 2026
<b>DER Modeling for Short Circuit and Protection Studies (Tech Update):</b> Evaluate short-circuit models for inverter-based DERs in common tools such as CYME, Synergi, CAPE, and ASPEN. Understand DER model capability and behavior in simulation tools and provide guidance on DER model parameterization for short circuit studies. Proposed joint deliverable with P200D.	<ul style="list-style-type: none"> <li>Improved DER modeling for short-circuit and protection studies</li> <li>Guidance to parameterize DER models using manufacturer data, lab test results, or generic DER characteristics for short-circuit studies</li> </ul>	October 2026
<b>Assessment of DER Models in Commercial Tools: Cyme and Synergi (Tech Updates):</b> Evaluate and identify improvements made and gaps remaining in DER models in commercial distribution analysis tools like Cyme and Synergi to accurately represent IEEE 1547-2018 requirements. Share findings with tool developers.	<ul style="list-style-type: none"> <li>Improve the accuracy of DER models in commercial software used by utilities to conduct interconnection impact studies</li> <li>Maximizing the benefits of smart inverter grid support functions through accurate analysis</li> </ul>	October 2026

Past EPRI Research on Topics

Product ID	Title	Description	Published Date
<a href="#">3002031097</a> <a href="#">3002028373</a>	IEEE 1547-2018 Smart Inverter Evaluation: UL 1741SB Certified Three-Phase Solar PV Smart Inverter and Residential Energy Storage System (ESS)	Learnings from this research is expected to help utilities utilize the full potential of IEEE 15487-2018 compliant inverters to address challenges of higher penetration of DERs.	2024 & 2023
<a href="#">3002030961</a> <a href="#">3002024431</a>	Value of Grid-Forming DER in Grid-Connected Operation Performance requirement for Microgrid Application	These reports documents potential benefits of GFM DER in grid-parallel mode and performance requirements for microgrid applications.	2024 & 2022

<p><a href="#">3002030964</a> <a href="#">3002030963</a></p>	<p>White-box Battery Energy Storage and Solar PV Inverter EMT Models in PSCAD with IEEE 1547-2018 Functions</p>	<p>Generic white-box EMT models in PSCAD for a three-phase grid-following battery energy storage and solar PV inverters with key IEEE 1547-2018 functions.</p>	<p>2024</p>
<p><a href="#">3002031156</a></p>	<p>DER EMT Analysis Screens: 1<sup>st</sup> Edition</p>	<p>This report documents screening criteria to help utilities determine when detailed EMT studies are necessary during the DER interconnection review process.</p>	<p>2024</p>
<p><a href="#">3002030962/GitHub</a> <a href="#">3002028324/GitHub</a></p>	<p>Open-Source DER (OpenDER) Model: Specifications: Version 2.2 Software Release: Version 2.2 Model Interface to OpenDSS</p>	<p>Objective of this research is to harmonize accurate interpretations of the IEEE Std 1547-2018 DER interconnection standard among stakeholders, including utilities, distribution analysis tool developers, and original equipment manufacturers (OEMs).</p>	<p>2024 &amp; 2023</p>
<p><a href="#">3002024404</a> <a href="#">3002030939</a> <a href="#">3002030940</a></p>	<p>DER Model Verification Framework: 2<sup>nd</sup> Edition Verification of Cyme Verification of Synergi</p>	<p>These reports provide a verification framework to evaluate accuracy of smart inverter models in distribution analysis tools and evaluation of DER models in CYME 9.3.1 and Synergi 6.21.0 versions.</p>	<p>2024 &amp; 2022</p>
<p><a href="#">3002028376</a></p>	<p>DER Performance Verification and Commissioning Guideline: Utility Current Practices and EPRI Recommendations</p>	<p>This report provides recommendations on types of commission tests important for utility, C&amp;I, and residential scale DERs and shares current utility practices.</p>	<p>2023</p>
<p><a href="#">3002021716</a></p>	<p>Stability Analysis and Volt-Watt and Volt-Var Control Setting Guidelines for DERs</p>	<p>This white paper provides guideline for volt-var and volt-watt control settings to avoid potential voltage instability concerns. The application of the setting guideline is demonstrated on a real feeder with multiple PV plants and its effectiveness is verified via time domain simulations.</p>	<p>2021</p>

<p><a href="#">3002019423</a></p>	<p>Impact of Interconnection Transformer Configuration on DER Operation</p>	<p>In this tech update, four types of transformer winding configurations are evaluated for the following DER interconnection concerns:</p> <ul style="list-style-type: none"> <li>• Ground fault overvoltage (GFOV)</li> <li>• Open phase overvoltage/ferroresonance when inverters cease to energize/trip</li> <li>• Open phase detection by inverters</li> </ul>	<p>2020</p>
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**Related Research**

This project set is coordinated with and complements the work undertaken in Energy Storage and Distributed Generation (P94), Information and Communication Technology (P161), Bulk Power System Integration of Variable Generation (P173), and Distribution Operations and Planning (P200).

**PS174C: DERMS and Microgrid Integration**

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**Objective**

The scope of the DERMS project set includes the central DERMS, the communication system and other grid edge components including DER gateways, microgrids and DER aggregation/VPP platforms. This project set is focused on supporting strategy, architecture, procurement, integration and operation of all the elements in a utility’s end-to-end DER management system. It provides up-to-date information that informs of technology capabilities, breakthroughs and lessons-learned from DER management projects worldwide. In addition, the project set provides tools and test procedures to carry out independent evaluations of DERMS. It also conducts research addressing microgrid implementation challenges, including identifying various system design approaches, evaluating operational control schemes, determining technical requirements, and supporting request-for-proposals.

In addition, the project set develops strategic DSO roadmaps for utilities. It also helps develop the processes, and tools; identify enhancements and develop actionable plans with language that can be used to solicit proposals during DSO transition.

**Approach**

This project set performs industry engagement and leadership in the area of DERMS. It performs hands-on evaluations of DERMS products in laboratory and field environments. Activities include:

- Developing consensus technical specifications to support utility requirements documents and request-for-proposals for DERMS, DER Gateways, Microgrid Controllers and VPP Platforms
- Developing technical requirements to build utility communication networks (e.g., AMI, SCADA) and cyber security frameworks to manage DER.
- Conducting vendor surveys to track market readiness of DERMS technologies, and communication protocols.

- Creating roadmaps to help utilities transition to DSOs by identifying DSO capabilities, processes, tools, and data required to enable DER to provide services.
- Evaluate gaps to address alignment with FERC Order 2222 objectives or utility specific goals.
- Facilitating DERMS and TSO/DSO coordination working groups on emerging topics of DER management
- Participating and technical contributions to IEEE, IEC, and other relevant standards for DER management
- Facilitating interest groups for peer exchange of experiences and challenges on DERMS and VPP deployment
- Developing state-of-the-art test beds to perform hands-on evaluation of commercial DERMS.
- Leading tutorials on DERMS fundamentals and TSO/DSO coordination methods to directly answer members’ questions on DER management.

**Research Value**

The proposed DERMS and Microgrid Integration research is expected to produce the following value:

- Save cost and time in planning and producing RFPs for DERMS, DER Gateways, Microgrid Controllers and DER Aggregation Platforms
- Establish and communicate utility’s vision for a DSO and the pathway toward enabling DER to provide services to the grid.
- Accelerate product availability through industry collaboration and cohesive utility requirements.
- Simplify the process of DERMS integration through improved design plans and requirements.
- Avoiding vendor lock-in through open architecture and standards-based requirements
- Improved business decisions through up-to-date awareness of the DER management market and products
- Understanding technology readiness of DER management technologies through evaluation and immediate access to test results
- Access to test plans, tools and reference design of the testing platform to support product evaluations.
- Inform industry of best practices for microgrid design and operations
- Streamline the integration of microgrids with utility operations.
- Inform industry of better methods to analyze microgrids for resiliency improvements.

**Anticipated Deliverables**

Deliverable	Value	Date
<p><b>DERMS Performance Benchmarking (Tech Update):</b>                      Develop DERMS benchmarking tests and evaluate the capabilities of one or more vendors leveraging the SPIDER and Ops testbeds. Create test plans and testbed setup guidance for commercial DERMS evaluation. Capture testing best practices and guide how to test the functionalities identified as part of earlier DERMS requirements work.</p>	<p>Reduces risk and cost of procuring “vaporware” DERMS products. Enables quantitative evaluation of DERMS vendor capabilities based on performance against key use cases. Supports procurement and deployment decisions with data-driven insights.</p>	<p>December 2026</p>
<p><b>Value of Network Model Accuracy on DERMS Performance (Tech Update):</b> In a world of flexible DER management, DERMS will calculate system needs and convert them into DER dispatch settings for reliable and safe grid operations. However, DERMS may not have the most accurate data and models to perform such calculations. The project will explore the accuracy in network model, DER monitored and forecasted data that are essential to calculate dynamic operating</p>	<p>Helps utilities understand the sensitivity of DERMS decisions to network data quality. Informs investment in monitoring, forecasting, and model validation to improve DERMS performance.</p>	<p>December 2026</p>

<p>envelopes for DERMS - Proposed joint deliverable with P174A.</p>		
<p><b>Interoperability Requirements for Managing Microgrid Components (Tech Update):</b> Implementing microgrid controls requires communication integration and device interoperability that extends beyond the requirements covered in IEEE 1547-2018. This technical report recommends communication architectures and interface interoperability requirements for microgrid operations. – Proposed joint deliverable with P161.</p>	<p>Understand the key microgrid island control functions that are not covered by existing standards. Quickly identify interoperability requirements needed to support microgrid implementation on utility systems.</p>	<p>October 2026</p>
<p><b>Role of DER Gateways in Integrating DER with Utility Operations (Tech Update):</b> Demonstrate the role of DER gateways in performing grid edge, utility specific functions when integrating customer’s DER with the utility’s DER management system. The project will also cover real-world case-studies of gateway deployments from utilities.</p>	<p>Provide in depth understanding on the role of DER gateways and strategies to integrate DER with utility operations using commercial gateways</p>	<p>October 2026</p>
<p><b>Integrating DERMS with Utility Enterprise Applications (Tech Update):</b> To fully orchestrate and leverage the benefits of DER, DERMS must integrate and use the information in other utility enterprise applications. The project will identify the need for DERMS to use data from other enterprise solutions like ADMS, MDMS, and CIS. Document the information exchange between DERMS and these other enterprise platforms.</p>	<p>Help the industry address data integration challenges for DERMS with utility enterprise applications.</p>	<p>December 2026</p>
<p><b>DER-Enhanced Distribution System Restoration Playbooks</b> Develop and validate updated restoration playbooks that integrate Distributed Energy Resources (DERs) capabilities and limitations. The project aims to enable faster, safer, and more resilient restoration strategies in grids with high DER penetration by addressing challenges such as DER disconnection/reconnection, inverter behavior, overvoltage, islanding risks, and lack of visibility/control of behind-the-meter DERs. Key research questions include safe DER reintegration, leveraging flexibility (e.g., BESS discharge or load control), and redesigning playbooks to incorporate DER data and constraints. Proposed joint deliverable with P200.</p>	<p>Enhances system resilience by integrating DERs into restoration planning. Reduces restoration time and improves safety through coordinated DER control. Adds resilience benefit stream to DERMS and microgrid-control investments</p>	<p>December 2026</p>
<p><b>Central vs Edge Intelligence for DER Management (Whitepaper):</b> Explores DER Management philosophies employed by utilities for DER Management. What functions are handled at what level and the interactions between levels. Highlight pros, cons, and hybrid approaches to DER management.</p>	<p>Clarifies decision-making on DER control architecture and investment. Helps utilities align DER strategies with operational and regulatory goals.</p>	<p>December 2026</p>
<p><b>DSO Models - Roles, Functions and Capabilities (Tech Update):</b> This work will document key models of future DSOs enabling market access and economic value for DER while maintaining reliability of the system. Detailed functions of each DSO model for enabling DER</p>	<p>Enable utilities determine their appropriate DSO model. Provide a roadmap for distribution utilities on their transition to DSO with detailed insights on the technical</p>	<p>October 2026</p>

to deliver grid services will be developed. Benchmark metrics to quantify the pros and cons of one model vs the other will be established as well.	capabilities to implement, workforce to develop and the organizational process changes to be made	
<b>DERMS Operator Desk, v2 (Tech Update):</b> Develop the DERMS user interface/dashboard for operators in the control room to monitor and manage DER operations on the electric grid. The project will also provide documentation of sample user interfaces for different DERMS applications, sample data to be presented to operators, historian, faceplates, definition of DERMS users (DERMS Engineers, Operators, Observers etc.,) and their access levels etc.	De-mystify the role and functions of a DERMS user and operator. Guide DERMS deployment through industry vetted approach.	December 2026
<b>Behind the Meter Energy Management System - Considering Co-located Generation, Storage, DR Markets:</b> Energy management system for an electric bus depot. Consider factors like co-located generation, energy storage, and demand responsive schemes. Realistic EV fleet operation and site limitations for medium term scheduling (hourly, week-ahead). Proposed joint deliverable with P174A.	<ul style="list-style-type: none"> <li>Optimize fleet charging operations, reducing energy costs and enhancing network stability.</li> <li>Enable participation in demand response markets, increasing operational flexibility and revenue opportunities.</li> </ul>	December 2026

Past EPRI Research on Topic

Product ID	Title	Description	Published Date
<a href="#">3002022194</a>	Implementing DERMS to Manage Grid Constraints (White Paper)	This paper summarizes the capability of DERMS to enable integrating higher DER capacities to the grid. It also provides an overview of current DERMS implementation options, their pros and cons, and the industry gaps that should be addressed to enable DERMS.	2021
<a href="#">3002031038</a> <a href="#">3002026451</a>	Utility Strategies for Implementing Distributed Energy Resource Management Systems (DERMS)  DERMS Adoption Pathways	These papers recognize the need for gradual processes and lays-out several DERMS adoption pathways that may be considered. In addition, it recognizes that the starting point and time will differ for each utility based on their situation, including DER adoption rates, regulatory policy, and distribution system capabilities.	2024 2022
<a href="#">3002018673</a> <a href="#">3002031043</a>	Applications of the Local DER Gateway EPRI's Reference Implementation of a DER Gateway	This white paper presents a range of potential uses of gateways that utilities deploy at DER sites as part	2021 2024

		of integration systems. These gateways are ubiquitous, typically needed to connect DER to utility networks and to provide the monitoring and control that is required for interconnection. Reference implementation of a Gateway software.	
<a href="#">3002023361</a>	Analyzing Telecommunication Systems for DER Integration	A technical approach to determine the capability of utility communication networks for managing DER was developed to help them better understand its current capabilities and limits.	2022
<a href="#">3002031087</a> <a href="#">3002021860</a>	Aggregator DERMS Provider Landscape Market Landscape of Commercial Utility DERMS: Utility DERMS Market Leaders Functionalities and Experience	These deliverables provide insights into a better understanding of commercial DERMS technology offerings, its functionalities, field experience, and development roadmaps of several leading distribution utility DERMS products.	2024, 2021
<a href="#">3002026643</a>	TSO-DSO Coordination Frameworks for DER Services	This report outlines various frameworks for coordination between a DSO, TSO and DER aggregator and discusses the roles and responsibilities of each involved entity and the implementation plan for enabling DER participation in electricity markets, without breaching operational limits, disturbing wholesale market operations, or reducing service quality for customers.	2023
<a href="#">3002031035</a>	Laboratory Evaluation of Commercial Utility Microgrid Controller Test Results	Application of a utility microgrid controller test plan and performance metrics in a controller-hardware-in-the-loop lab environment. Evaluation of a commercial microgrid controller's ability to meet feeder-level microgrid operational objectives under different operating modes (islanded, grid-connected, in-transition).	2024

<a href="#">3002021842</a>	Understanding Community Microgrids	A technical primer for understanding community microgrids. It provides a foundation for understanding the components, configurations, design, and operational considerations for community microgrids.	2021
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**Related Research**

This project set is coordinated with and complements the work undertaken in Energy Storage and Distributed Generation (P94), Information and Communication Technology (P161), Bulk Power System Integration of Variable Generation (P173), and Distribution Operations and Planning (P200).

**PS174D – Practices, Programs, and Economics**

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**Objective**

The aim of this project set is to improve the operational efficiency by which utilities manage DER on distribution to optimize DER value and inform related utility strategic planning rationales. Activities seek to streamline utility interconnection practices and procedures in ways that reduce costs while maintaining grid safety and reliability; provide guidance regarding the economic implications of scenario-based DER integration approaches – including those specific to non-wires alternative and virtual power plant projects (which often hinge on time and locational value factors), resilience, and grid management approaches involving a DERMS; and qualify utility DER business models, programs, and procedures, including strategies for enabling flexible DER grid services under different rate/tariff structures, regulatory policies, and interconnection terms.

**Approach**

The Practices, Programs, and Economics project set for 2026 includes the following core areas of focus and associated tasks:

- Operational and Interconnection Practices.** Identifying, assessing, and documenting leading operational practices and approaches for planning, grid integrating, and managing DERs. Focus areas include interconnection and commissioning, protection, communication, advanced inverter functions, and standards and certifications. These practices are gathered through utility surveys, interview, working group participation, and secondary research.
- DER Program Design Strategies and Business Models.** Tracking and evaluating utility DER business model concepts and real-world program implementations that facilitate utility participation in the DER marketplace and the provision of DER grid flexibility services. Task activities are pursued through primary and secondary research.
- Economic Analysis.** Conducting cost-benefit analyses of a range of DER technologies and use cases to assess their value under different grid contexts. Economic evaluation is applied through tools and methods to discern, for example, the time and locational value of DER, the merits of NWA/VPP projects, as well as

customer-facing utility programs, the value of advanced inverter functions, and the economic justification for leveraging DER for resilience.

- **Regulatory and Policy Issues.** Providing objective education and guidance on a range of DER regulatory frameworks and reform activities to help inform public debate. Covered topics – such as the influence of utility economics on utility DER decision making, cost allocation approaches, vehicle-to-grid and DER grid flexibility mandates, DER pricing mechanisms/tariffs, and potential conflicts between DER policy goals and grid reliability objectives – are based on member priority and explored via primary and secondary research.

**Research Value**

Proposed research is expected to produce the following value for participants:

- Objective, case study-driven and economic analyses to inform DER integration strategies.
- Methodologies for building internal cost-benefit analyses that incorporate context-specific factors (including the use of advanced inverter functions, DERMS; the value stacking of grid services).
- Access to tools for 1) screening NWA and VPP opportunities based on the time and locational value of DER, 2) evaluating DG-based resilience value, and 3) determining the economic justification of investing in a DERMS.
- Guidance for improving the efficiency, cost, and cross-departmental coordination of DER-related utility interconnection and operational processes, including those relevant to active power management, DER scheduling, and EV integration.
- Fluency in DER standards/certifications, gaps, and ongoing activities that intend to further evolve the use and management of DER on the distribution system.
- Understanding of the multiple elements relevant to successful DER program design, implementation, and management—including those relevant to the provisioning of DER grid services.
- Peer learning specific to NWA and VPP program structures, cost-benefit assessment, operation and performance analysis, siting considerations, and reliability/resiliency experiences.
- A platform for educating utility staff and upper management, regulators, and policymakers about business case analysis as it relates to DER integration.

**Anticipated Deliverables**

Deliverable	Value	Date
<p><b>DER Interconnection Process Guidebook, 3<sup>rd</sup> Edition (Website):</b> Expand reference guide coverage of lifecycle DER interconnection/integration processes. Topics: Managing schedules and flexible interconnection data, V2G integration &amp; 1547 compliance, procedural automation, portals/platforms, queue management, DER capacity reservation, interconnection process KPIs/analytics for measuring organizational performance.</p>	<ul style="list-style-type: none"> <li>• Comprehensive knowledge center for DER Interconnection.</li> </ul>	<p>Q4 2026</p>
<p><b>DER Technical Screening Web Tool, v3.0 (Software):</b> User-driven web-based app demonstrating scenario-based DER evaluation via interconnection screening; builds on EPRI AI/automation research to explore procedural efficiencies.</p>	<ul style="list-style-type: none"> <li>• Visualized results to educate on interconnection impacts and best practice review approaches that reduce cost/labor demands.</li> </ul>	<p>Q4 2026</p>
<p><b>Evolving DER Interconnection "Next" Practices (Workshop):</b> Facilitate interactive workshop examining DER interconnection challenges and best/next practices</p>	<ul style="list-style-type: none"> <li>• Exploration of how DER flexibility, DER aggregation, V2G, and other</li> </ul>	<p>Q2 2026</p>

to raise utility awareness on how utility interconnection programs are evolving to meet flexibility, hi-pen scenarios, standards compliance needs; potential AI-driven advancements.	pressing issues, are handled in interconnection review processes.	
<b>Strategies for Developing Utility/DSO DER Grid Flexibility Services (White Papers):</b> Detail utility technical/business strategies and tactics for sourcing DER for distribution services, highlighting structural elements that enable DER flexibility. Topics: trustworthiness scoring of 3rd party DER grid service providers, the economic potential of flexibility services, exploring the DSO service arrangement, assessing the congestion pricing as a means for procuring flexibility.	<ul style="list-style-type: none"> <li>Guidance on how to develop utility programs and practices that leverage DERs for grid flexibility services.</li> </ul>	Q2/Q4 2026
<b>Modern Virtual Power Plant Structures and Programs (Tech Update):</b> Demonstrate programmatic structures, strategies, and requirements for DSO, Aggregator, and others as FERC Order 2222 implementation becomes reality.	<ul style="list-style-type: none"> <li>Blueprint for establishing VPP programs that realize customer and grid benefits.</li> </ul>	Q4 2026
<b>Showcasing Real World VPP/NWA Project Results (Workshop):</b> Conduct 4 <sup>th</sup> annual virtual workshop focused on real-world utility experiences planning, implementing, operating VPP/NWA programs. Emphasis: outcomes and results. <a href="#">Proposed joint deliverable with P200/P94.</a>	<ul style="list-style-type: none"> <li>Lesson learned, collaboration w/peers engaged in developing and operating VPP/NWA programs.</li> </ul>	Q2 2026
<b>Change Management: Organizational Readiness for DERMS (Tech Update):</b> Develop a blueprint for establishing organizational change management supportive to DERMS adoption and integration. <a href="#">Proposed joint deliverable with P174C.</a>	<ul style="list-style-type: none"> <li>Adapt utility organization and processes to incrementally/fully integrate DERMS into utility operations.</li> </ul>	Q4 2026
<b>Methods &amp; Data for Economically Valuing DER-based Grid Resilience (Tech Update/Wiki):</b> Develop tools (willingness-to-pay calculator), frameworks (resilience value estimation), programs structures (resilience-as-a-service case studies), and accompanying data for determining the value of energy resilience from DERs.	<ul style="list-style-type: none"> <li>Cost-benefit analysis expertise for estimating the value of utility resilience measures.</li> </ul>	Q4 2026
<b>Key Insights from DER-related Regulatory Actions (Tech Briefs):</b> Document selected regulatory activities (e.g., V2G, DER flexibility, grid services rulemaking/pilot mandates), identify targets, and recommend compliance approaches.	<ul style="list-style-type: none"> <li>Awareness/improved preparation to address regulatory actions relevant to DER integration.</li> </ul>	Semi-annual

**Past EPRI Research on Topic**

Product ID	Title	Description	Published Date
<a href="#">3002030968</a>	The DER Interconnection Process Guidebook: First Edition	Demonstrates how a utility can optimally communicate policy and technical requirements	2024

		externally, efficiently collect project information, vet interconnection requests with appropriate levels of technical precision, validate project designs/construction, and maintain appropriate awareness throughout the DER project lifecycle.	
<a href="#">3002028288</a>	DER Interconnection Standards & Certifications in North America: Overview & Status Update	Provides a primer on the standards and certifications relevant to DER interconnection to help inform utility thinking on DER interconnection compliance pathways and considerations.	2023
<a href="#">3002030457</a>	Utility Strategies for Accessing Grid Flexibility from Aggregated DERs	describes the key factors driving DER aggregation; conveys early, real-world examples of aggregated DER use; and identifies possible utility strategies for leveraging DER assets to benefit the electric distribution and bulk power systems.	2024
<a href="#">3002030316</a>	Utility Strategies and Lessons Learned from NWA Projects: 2024 Workshop Proceedings	Contains materials and key takeaways from the 2024 NWA workshop that are intended to support peer learning on utility NWA efforts.	2024
<a href="#">3002027231</a>	Distribution Services Provided by DER: 2023 EPRI Research Guide	Provides an entry point into several years of EPRI research on the holistic integration of service-based DER solutions into standard utility practices.	2023
<a href="#">3002027903</a>	A Framework for Evaluating the Benefits of Applications Enabled by Utility DERMS	Defines 14 DERMS-enabled applications that correspond to planning or operational processes enabled by DERMS that have a clear business purpose for the distribution utility.	2023
<a href="#">3002022432</a>	A Framework for Calculating the Resilience Value of DER-based Solutions for Defined Built Environments	Describes an extensible approach for assessing the resilience value provided by DER in the context of extended power outages lasting days or weeks.	2023

<a href="#">3002029106</a>	Considering the Equitable Allocation of DER Hosting Capacity	Describes various tactics to more equitably promote DER – including updates to cost sharing strategies, community solar approaches, as well as flexible interconnection and active power management practices – and lays out pros and cons for each.	2024
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**Related Research**

The research in this project set is closely coordinated with and designed to complement the work undertaken in the following EPRI programs: Energy Storage and Distributed Generation (P94), Understanding Electric Utility Customers (P182), Bulk Power System Integration of Variable Generation (P173), Grid-Edge Customer Technologies (P170), and Distribution Operations and Planning (P200).

**PS174E – Technology Transfer and Industry Engagement**

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**Objective**

The aim is to deliver practical knowledge and enable sharing of experience, practices, and solutions related to DER. Utility managers and staff can immediately use the knowledge provided to improve distribution system design, screening, troubleshooting, and safety practices relative to DG. DER application experience is provided by webinars, tech briefs, interest groups, DER Forum, DER Engineering Guide, and web-based materials in the program Members Center. These allow for easy access to program knowledge, discussions, and staff. Typical questions that this program answers are:

- What are the current trends in DER technologies and deployments?
- Are there DER integration-related problems where solutions to be shared or enhanced?
- What standards and practices need to be considered with increasing penetration?
- What’s needed for DER built-in protection and control responses to be sufficient and coordinated?
- What lessons-learned and new practices can be shared and applied?

**Approach**

Technical transfer is designed to facilitate information exchange and problem solving among members via the DER Forum, webcasts, email communications, advisor meetings and project reviews on topics of current interest. Its scope is to consolidate useful knowledge, highlights of best practices, and lessons learned into software and engineering resources that are readily available and regularly updated. Examples of technology transfer resources and tools include:

- A web-based DER and Energy Storage member's forum, periodic summaries of issues and covering interesting exchanges and key learnings (joint activity with P94, Energy Storage and Distributed Generation Program).
- Regular webcasts on DER topics of interest and periodic member visits
- Program advisory meetings, periodic workshops/symposiums, with mid and end of year program updates via webcast to address progress on deliverables.

- Technical briefs and/or white papers to assist members on specific integration technical issues or in communicating grid considerations to utility customers, regulatory bodies, and DER developers.
- DER Field Experience Interest Group discussions including lessons-learned, findings and identification of current practices (via surveys/polling) and issues requiring further investigations.

**Research Value**

Members gain access to DER integration and distribution engineering experts to address specific challenges in a timely manner and stay informed on key technical developments. The project includes the following:

- Answers to questions about new technologies and grid integration approaches.
- Engagement in key standards activities.
- Access to learning across Integrated-Grid projects.
- Knowledge sharing among members.
- Problem solving via research collaborations and working with individual members.

**Anticipated Deliverables**

Deliverable	Description (one sentence)	Date
<a href="#">DER Integration Resource Center</a>	Provides one-stop destination for all program information as well as handy tools and sample utility and jurisdictional documents in following repositories; Results Finder, Connection, DERMS RFPs, Solar Data, Analytics, Screening Processes and DER Forum links/search.	Maintained and updated with materials approximately semi annually
DER Field Experience Interest Group	Sharing of DER field experience includes surveys and polling of utility practices (joint with energy storage, P1).	Held monthly
Engineering Guide for Storage and Distributed Generation	Provide accessibility via the DER Resource Center, including integration practices, interconnection, screening and, includes DER operation, planning, protection, tools, and technologies (joint project with P94).	December 2026
DER Integration Standards Support/Member Updates	Participate, engage and lead DER related standard’s development activities, provide technical input informing the process and consider in member related research activities. Includes timely resources (briefs, white papers, surveys, etc.) addressing latest DER technical issues and practices.	Approximately quarterly
Common File Format (CFF)	Continue developing the CFF as an industry best practice; to address the challenges of inconsistent DER setting exchanges and to verify proper DER field configuration. Promote and assist utility and industry adoption via training, CFF file reviews for accuracy, tool to generate CFF file, lab/field testing, online hosting of utility generated files, and COFFEE industry interest group discussions.	Ongoing with an end of year white paper on adoption status.
Distributed Energy Resources and Energy Storage on-line <a href="#">DER Forum</a>	Conversations addressing technical topics of interest with questions and answers as well as opportunity to add on points or further inquiries, available at <a href="http://derforum.epri.com">derforum.epri.com</a> (Proposed joint deliverable with P94).	Maintained daily, available 24 hours with and archiving all prior discussions

## Past EPRI Research on Topic

Product ID	Title	Description	Published Date
<a href="#">3002033034</a>	Understanding Transmission or Sub-transmission System Ground-Fault Overvoltage	This Technical Update provides background and analysis to understand the T-GFO issue and offers guidelines to determine system conditions that may result in potentially damaging overvoltages.	2025
<a href="#">3002030551</a>	Generic Technical Interconnection and Interoperability Requirements (TIIRs), 2nd Edition	The scope of this TIIR template encompasses DER interconnection requirements that are compliant with applicable standards, as well as other obligations for integrating DER into the utility's distribution system.	2024
<a href="#">3002030783</a>	Hot Line Tags: Developing a Comprehensive Strategy	Obtaining a hot line tag consists of a series of steps that utilities take to promote safety associated with working near or on energized lines. This paper discusses some distributed energy resource (DER) protection strategies while hot line tags are applied.	2024
<a href="#">3002028406</a>	Utility DTT Practices Survey	DER Deployment and Island Prevention Survey includes 80 utilities input on practices, Behind the Meter (BTM) and Front the Meter (FTM)	2024
<a href="#">3002028373</a>	DER Active Power Management	Provides an update on options for active power management including curtailment and DERMS	2024
<a href="#">3002027231</a>	DER Interconnection Research Guide	Distribution Services Provided by Distributed Energy Resources (DER) 2023 EPRI Research Guide	2023
<a href="#">3002023483</a>	DER and Energy Storage Engineering Guide	A comprehensive guide, 5th edition, intended for utility engineers facing increasing levels of distributed generation and storage, with higher expectations for grid support, more settings and control options. Includes links to DER Forum.	2022
<a href="#">3002020130</a>	Grounding Practices	Report addresses effective grounding, basic principles, ground sources, and the role of DER transformer connections,	2020

		load types and tripping response of inverters. DER capabilities such as negative sequence compensation are covered.	
<a href="#">DER Forum</a> in Resource Center	DER and Energy Storage Forum	This resource provides results from questions on DER grid integration, energy storage, issues, trends, and state of technology.	Current
<a href="#">DER Resource Center</a>	DER Resource Center	11 libraries of DER integration program content. Includes <a href="#">Results Finder</a> , <a href="#">Forum</a> , Data samples, Program Calendar, Dashboards as well as utility interconnection practices and suggestion box.	Current

**Related Research**

This project set is coordinated with and complements the work undertaken in Energy Storage (P94) Bulk Power System Integration of Variable Generation (P173) and Distribution Operations and Planning (P200).