Success Stories 2024-2020
Information and Communication Technology (ICT)

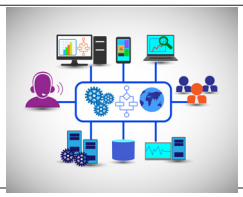
EPRI member application success stories showcase research insights addressing specific issues, offering potential solutions, and delivering valuable knowledge transfer, thereby adding significant value to member organizations.

Topic

Available Fault Current (AFC) Simulation and Risk Analysis, Southern California Edison(SCE) (2024)
Teleprotection is essential for the safe operation of transmission lines, and this work supports SCE's ability to continue providing reliable service to customers. The analysis of 6 GHz band sharing, which requires an understanding of Federal Communications Commission (FCC) rules, AFC methodologies, and obstructions, will set a precedent for future band sharing plans for both federal and non-federal spectrum.

Enterprise Architecture, Alliant Energy (2024)
Alliant Energy used EPRI's Capability model to map business capabilities to software applications across all portfolios. The software applications were then placed under the Gartner T-I-M-E model to understand what applications needed to migrate or eliminated. The EPRI capability model provided the view of multiplication software applications used at Alliant Energy for one business capability which created technical debt. Alliant Energy is meeting with their business stakeholders to create a plan on migrating and eliminating the software applications. Eliminating or migrating these applications will reduce technical debt and reduces O&M cost by more than a million dollar

Enterprise Architecture Maturity Assessment, Salt River Project (SRP) (2024)
The research developed a maturity model that not only assessed SRP's current maturity level but also provides a framework for ongoing evaluation and improvement. It identified key actions to enhance maturity, supporting SRP's efforts as IT and OT converge and digital transformation progresses, with Enterprise Architecture playing a crucial role in driving the energy transformation.



Grid Model Data Management, American Electric Power (AEP) (2024)
Distribution Grid Model Management (GMDM) is increasingly critical for the energy transition to plan and operate grid with Distributed Energy Resources and for Advanced Distribution Management services like volt/var optimization (VVO), fault location isolation and repair (FLISR) and Distribution Automation (DA). GMDM is especially problematic in the Distribution domain because of the variety of applications, their roles, the complexity of data and the lack of standardization. Getting distribution grid model management in order is essential to further integrate T&D modeling and planning. Centralizing grid model management will reduce the data processing workload for power system engineers, increase model quality and synchronization and enable advanced distribution management services. It will also enable much more automated analysis of the distribution system, allowing for faster response times and higher fidelity and confidence in results when customer interconnection requests are received.

Grid Network Model Management, Ameren (2024)
The Ameren Integrated Network Model Management (INMM) EPRI project extended EPRI's Grid Model Data Management architectures to enhance network model management practices at Ameren. Recognizing that this challenge was industry-wide, the project leveraged IEC CIM standards to create a more effective solution, including the development of a business case that secured funding for a multi-year initiative. This initiative led to the selection and implementation of Cimphony, a CIM-based network model management platform, which now manages over 6,000 feeder models for Ameren's ADMS system and planning applications. Daily updates from GIS models and integration with data from AMI readings and a master equipment catalog further support this system, with planned integrations into ADMS and Synergi in 2025.

Success Stories 2024-2020
Information and Communication Technology (ICT)

Low-Latency Wireless Communications, Consolidated Edison (ConEd)(2024)
Low-latency, high-reliability communications are becoming increasingly critical in electric distribution as the number of DER sites grows, creating a need for more advanced protection systems. EPRI's research has been instrumental in guiding the planning and engineering of the company's distribution grid, enabling confident design decisions that support the scalable and efficient integration of DERs. This research facilitates widespread DER adoption by providing a more robust framework for connectivity, optimizing resource allocation, and fostering innovation, ultimately contributing to a more sustainable and resilient energy ecosystem.

Emerging Information, Communication Technology (ICT) and Technology Transfer - PECO, an Exelon Company (2023)
The role of the Emerging Technologies and Technology Transfer (161A) Project Set is to provide insights into ICT standards, issues and learnings from peer utilities across a broad range of interoperability, data-centricity and telecommunications topics for an advanced electric grid infrastructure.
"The information sharing and networking with EPRI and my peer utilities on a variety of Information and Communication Technology (ICT) topics keeps me informed of the EPRI research and abreast of emerging trends." Glenn Pritchard, Senior Manager,Advanced Grid Operations & Technology, PECO.

"3rd Thursday of the Month" Emerging Technology Webcasts and ICT Program White Papers. - **American Electric Power (AEP)** (2023)
The 161A "3rd Thursday of the Month" webcast series provide regular updates on emerging trends and insights of the entire program with topics determined based on member input.
"The 10 technical "3rd Thursday of the Month" webcasts and the White Papers produced in 161A are timely and good assessments of the covered topics and are helpful in providing useful talking points to others across member utilities business units at AEP.", Ron Cunningham, IT Enterprise Architect, AEP.

Advanced Communications, Standards, and Controls of Smart Inverters and Smart Devices to Enable More Residential Solar Energy - Southern California Edison, Pacific Gas and Electric (2023)
The project allows an understanding of advanced smart-inverter functions, as defined in California's Rule 21 tariff and communication systems to manage them. The following two methods assessed the smart inverter behavior using laboratory and field tests: (1) successful side-by-side operation of smart inverters; and (2) using residential smart loads to enable more solar PV on the grid. Specific test procedures for smart inverters and smart loads, and distributed energy resource (DER) management algorithms and communications architecture were developed and applied for smart loads and inverters to enable higher penetration of solar energy. The smart inverter functions, together with smart (PV-optimized) use of their loads, have shown that more solar PV capacity, and more PV total production in the distribution grid can be achieved by application of the project results.
The laboratory testing and research applications by the two largest California utilities, PG&E Company (PG&E) and Southern California Edison (SCE) allowed power quality functions (e.g., voltage, frequency), solar variability and consumer activity to be varied in a controlled fashion, thereby evaluating the full range of conditions. Field testing brought-in real-world conditions that might be overlooked in the laboratory, including power quality changes and other factors induced by load-changes. Another key aspect of the testing was the communication and controls architecture that reflected the real-world conditions and leveraged the interoperability standards-based approaches such as CTA-2045.

Success Stories 2024-2020
Information and Communication Technology (ICT)

Economically Feasible, Secure DER Network Gateways for Control Integration of Smart Inverters - New York Power Authority, Consumers Energy, North Carolina Electric Membership Corporation, Électricité de France, Salt River Project, Evergy, Southern Company, Exelon, Tennessee Valley Authority, KEPCO (2023)

Today, utilities are deploying DER management systems (DERMS) that intend to connect with DER, making them an integral part of system operations. However, this remains a challenge due to the revolving mix of DER types and capabilities that will be continuously interconnected and retired over time. Standardization efforts like IEEE 1547-2018 make the integration possible by specifying simple functions to the DER and leaving many utility-specific functions to the integration systems. The DER Gateway is designed to address these management-specific functions. It serves as a local platform housing features and logics important to the utility. It also performs several other important functions including translation of the DER's communication protocol to the protocol used in the communication network and enabling secure integration with utility operations.

The DER Gateway requirements document provides a reference set of requirements for DER gateways and is useful for utilities to develop RFPs. It covers a broad set of potential use cases of a DER gateway and can also be used by commercial entities to better understand market needs. Additionally, an IEEE standard 1547.10 for "Recommended Practices for DER Gateway Platforms" was also launched under EPRI leadership to reach various stakeholders to create a standard document for DER gateways. Link to Supplemental Project Offering.

Utility Business Capability Model for Investment Optimization - National Grid USA (2023)

The Utility Business Capability Model is an important tool in the ability to perform strategic business capability-based planning—that is, planning that prioritizes a focus on capabilities that meet the stated strategic initiatives of a company.

National Grid led the advanced application in the capability-based planning domain both internally and with other project participants. The project owner led the impact of the business capability model across National Grid and inspired its application at other utilities. The recognition of the capability-based planning within National Grid and strategic initiatives is related to the National Grid utility of the future.

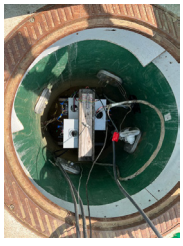
Next Generation Metering Requirements - Exelon Family of Companies (PECO Energy Company (PECO) and Commonwealth Edison (ComEd) (2023)

This work is a great example of how EPRI and Exelon can collaborate to investigate new opportunities for AMI and Smart Meters to advance the functionality of the distribution grid and continue to meet customer expectations of high quality reliable electric service.

The project team leveraged EPRI knowledge as a catalyst to improve the flexibility of metering system, utilize alarms better, and utilize voltage and other data more effectively. Exelon has a dynamic environment with competing priorities and incentives, and the EPRI project provided clarity in pursuing these initiatives.

Remote Operation of AMI meter disconnect in Natural Gas environment - Consolidated Edison Company (ConEd) (2023)

The use and usefulness of having remote electric service connect/disconnect switches integrated into electric meters has been well established. One new potential use case is to employ the electric service disconnect in meters when the operator receives notification of a natural gas leak from gas inside a building. By disconnecting the electric service, the potential for endues equipment to cause a spark is eliminated, but the question is what effect the disconnect itself might have in this situation. This research addressed that question.



Success Stories 2024-2020
Information and Communication Technology (ICT)

6GHz testing - **Nebraska Public Power District** (2023)

The Federal Communications Commission (FCC) issued a Report and Order (R&O) in April 2020 that allows unlicensed devices (such as Wi-Fi) to operate in 6 GHz microwave radio bands that were previously exclusively licensed. This regulatory change introduces the possibility of harmful interference to existing microwave systems, including those used by utilities for SCADA, system control, and teleprotection. These microwave systems were not designed to deal with interference from unlicensed devices.

"Our big takeaway from the EPRI 6GHz testing is the interference testing and the results we have access to. We are also engaged with EPRI testing in private Long-Term Evolution (LTE) space in case we need to go down that road for leased Remote Terminal Units (RTUs). Future plans include having the Telecommunications Operations Center (TOC) evaluate the EPRI Network Monitoring Guidebook to determine value and implement on our network if appropriate." Matt Holthe, Telecommunications Manager.

6GHz testing Salt River Project (SRP) and FirstEnergy (2023)

This work has benefited SRP through mitigation of risk associated with potential interference around the 6GHz band. SRP has over 25 point to point microwave paths that utilize 6GHz spectrum which can now be used for lower power indoor devices for WiFi and eventually, standard power outdoor devices as well. Impacts to these microwave paths could impact the reliability of SRP's Wide Area Networks (WAN) which in turn could impact reliability of other services including SRP's ability to operate generation facilities. FirstEnergy: The issue of interference to utility-owned licensed microwave links from unlicensed devices is ongoing and has many nuances. One open question was the potential for additive impact of many Wi-Fi networks operating in the vicinity of utility microwave links. This research conducted field testing and found a measurable additive impact effect on microwave links, which reduces their reliability. It provides the first quantitative test data to counter simulation studies that claimed additive interference would not occur.

SRP: Additional understanding of the risk was gained which allowed SRP to proactively produce a plan to help mitigate that risk.

FirstEnergy: The research provides data to quantify the impact of multiple unlicensed devices to utility communications systems. EPRI and FirstEnergy worked together to conduct real-world testing with multiple unlicensed networks to provide the first utility testing and impact analysis of the additive contribution to interference. Utilities can utilize this knowledge of increasing interference when making decisions about network upgrades and maintenance of existing systems. The results aid in knowing what to look for when troubleshooting interference on their microwave links, and how to prioritize microwave upgrades, re-banding, and fiber replacement projects.

Data Quality Project Case Study - Salt River Project (2023)

Salt River Project GIS Data Improvement for ADMS. At Salt River Project ADMS guides the implementation of GIS data improvement effort development. The group was formed from across distribution to develop a framework that merged two existing GIS Databases. Data errors were identified and prioritized, and the lessons learned will be incorporated into next steps that are summarized in a case study.

"3rd Thursday" Emerging Technology Webcasts - ConEdison (2022)

In 2022, the ICT Program started the Emerging Technologies, Interoperability & Technology "Third Thursday" of the month webcast series to provide a more regular and member driven technology transfer of the entire program. The webcasts provide insights from all 6 projects sets twice per year and the topic for each month is selected by webcast participants.

"With all the industry priorities and needs, the ICT program is doing a great job to emphasize the strategic importance of data-centricity, telecommunications and interoperability. I really like the "3rd Thursday of the Month" webcasts that provide bite-size research updates on emerging information and communication technologies. This combined with the advisory and task force meetings provide good opportunities to learn and where to go to get additional EPRI support to get value from our EPRI investment." Steve Go, ConEdison

Success Stories 2024-2020
Information and Communication Technology (ICT)

EPRI ICT Program (161A) - Technology Transfer Activities - Ameren (2022)
The role of the Emerging Technologies and Technology Transfer (161A) Project Set is to provide insights into ICT standards, issues and insights in a variety of formats from webcasts, white papers and advisory meetings.
"The variety and depth of topics on the ICT Monthly webcasts combined with the technical papers is very helpful and the advisory meetings are my favorite. With my responsibilities changing from metering to telecommunications making the connections to ICT provides a valuable breadth of information.", Kirby Diller, PE, Ameren

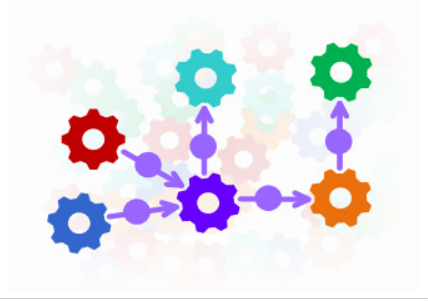
Advanced Communications, Standards, and Controls of Smart Inverters and Smart Devices to Enable More Residential Solar Energy - Southern California Edison (2022)
Advanced smart-inverter functions defined in California's Rule 21 tariff pave the way for grid supportive DERs. This project assessed the smart inverter behavior of Rule 21 inverters using laboratory and field tests. Tests included successful side-by-side operation of smart inverters and using residential smart loads to enable more solar PV on the grid.
Field testing brought-in real-world conditions that might be overlooked in the laboratory, including power quality changes and other factors induced by load-changes. Another key aspect of the testing was the communication and controls architecture that reflected the real-world conditions and leveraged the interoperability standards-based approaches such as CTA-2045.

CTA 2045 Field Pilots Guide a Path Towards Grid-Enabled End-Use Devices - Duke Energy (2022)
A technology that continues to be at the forefront of demand response enabled products is the standard known as CTA-2045. EPRI has worked intensively with the industry to develop specifications, test tools, and other resources to support utilities and manufacturers to adopt this new, promising demand response technology.
EPRI's work supporting the commercial availability of CTA-2045 enabled appliances and communication modules allowed Duke to test new innovative applications in lab and field settings. This includes flexible two-way communication to appliances, zero-truck roll implementation, ease of communication upgrades, and maintaining customer comfort during demand response events.

Business Capability Model Development for IT-OT Investment Alignment - Ameren, ConEd, Exelon, National Grid, NYPA, PNM, SRP (2022)
The two-year project created a Utility Business Capability Model with 8 utilities. Each utility applied and refined the business capability model on their own strategic initiatives including customer experience, asset management and the utility of the future. The primary contributors from the eight utilities received a technology transfer award for their work on this project.
"The EPRI Business Capability Model and associated methods and tools helped SRP take the first step toward capability-based planning, shifting the strategic conversation from acquiring things to understanding what capabilities are need to deliver value to your customers." Shanon Jones, Manager, Architecture & Planning,
Salt River Project (SRP). "The EPRI Business Capability model has added credibility to our NG Capability Model work across internal stakeholders and external partners, validates and improves our approach to standardization and efficiency, and provides a foundation for much needed industry collaboration around utility of the future, transformational shifts, strategic initiatives and more."
Jennifer Cooper, Director, Future of Electric, National Grid.

Success Stories 2024-2020
Information and Communication Technology (ICT)

Distribution Grid Model Data Management Vendor Forum (2022)
EPRI began its distribution Grid Model Data Management (GMDM) research in 2017. EPRI's strategy is to develop a unified, vendor-agnostic architecture to enable energy providers to better manage their distribution grid data using products that operate and communicate with each other more accurately. The value of this architecture – and its practical application– was demonstrated at the recent EPRI/UCAIug CIM Interoperability event. More details and value statements from each of the vendors here: Interoperability Event Demonstrates Successful Grid Model Data Exchange | Energy Central
EPRI's GMDM project is a natural alignment with our Energy Digital Twin solution. This IOP event proved that the proposed interoperability works and uncovered an exciting insight and validation from the data exchanges and collaboration of different vendors." Esen Kacar, Principal Product Manager
"Thanks to EPRI for the leadership in the Grid Modeling and Data Management (GMDM) project. The project created an architecture for utilities to solve the vexing problem of interoperability of several network management applications such as GIS, ADMS, and network analysis. EPRI allowed us to partner with Safe Software to provide the tools to successfully model the Esri GIS into the most up-to-date CIM model. In addition, they facilitated the process to validate that various network management vendors could consume the CIM output from the ArcGIS Utility Network. This process demonstrated the ability of CIM to model the electric network in a standard, detailed and neutral structure." Bill Meehan, Director, Electric Utility Solutions



Advanced Metering Systems - Exelon (2022)
Exelon utilities' participation in the Next Generation Smart Meter Vision and Criteria project identified new meter functionality to enhance operations and functionality. PECO chose to focus on downloading applications and configurations to the meter, programming low and high voltage points, and implementing an interval voltage channel based on EPRI's findings.
The utility's project teams leveraged EPRI research as a catalyst to improve the flexibility of our metering system, enhance quality control, and utilize alarms, voltage and other data more effectively. Both PECO and ComEd have a dynamic environment with competing priorities and incentives, and the EPRI project provided clarity in pursuing these initiatives.

EPRI Guidebook to Improve AMI System Health Monitoring - Southern California Edison (2022)
This document is a guidebook for utilities that details a recommended practice for AMI system prognostics and health management (PHM). The procedures outlined herein are intended to guide utility test procedures that provide insight into the remaining useful service life of AMI systems.
"Going through another mass deployment is not an option, we must proactively understand the long-term reliability of our AMI system.", Jeffery Counseller, Southern California Edison

6GHz Additive Interference Study - FirstEnergy (2022)
In 2020, FCC issued Report & Order (R&O) 20-51 that allows unlicensed device operation in the upper and lower licensed 6 GHz fixed service (FS) microwave radio bands. This band has been licensed for exclusive use by utilities and others. Electric utilities continue to be concerned about the possibility of interference that could cause failure of their critical communication links. One open question has been the potential additive impact of many Wi-Fi networks operating in the vicinity of utility microwave links.
FirstEnergy was able to utilize the testing recommendation and knowledge for making decisions about network upgrades and maintenance of existing systems. The results aid in knowing what to look for when troubleshooting interference on their microwave links. Utilities can speak with more credibility about the harm unlicensed Wi-Fi devices may have on critical communications that support grid management and voice services.

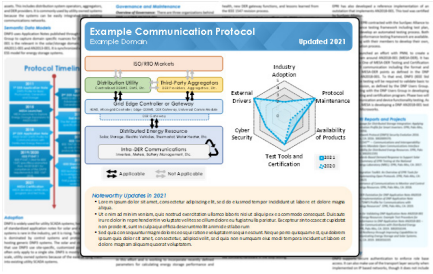
Success Stories 2024-2020
Information and Communication Technology (ICT)

Private LTE Testing and Performance Assessment A testing platform for Field Area Networks (The FAN Testing Platform) - New York Power Authority (NYPA) (2022)
A testing platform for Field Area Networks (The FAN Testing Platform) has been developed as part of the Information and Communication Technology project set 161G on Telecom to assist utilities. NYPA applied the FAN Testing Platform to perform an assessment of the performance of the Private LTE pilot that was in operation at the Blenheim-Gilboa pumped hydro facility.
The research revealed the detailed performance characteristics of the Private LTE system, enabling NYPA to better understand the capabilities of the prototype system at the pilot, and plan for future deployments. The testing also revealed new learnings about the overall network architecture that will be essential for integrating the PLTE network into the overall NYPA operational network.

Geospatial Informatics (GIS) - Consolidated Edison (2022)
The Geospatial Informatics project set focuses on the science and technology of acquiring, storing, cleaning, modeling, analyzing, producing, presenting, and disseminating geospatial data sets. Collaborative research projects in this area will enable utility geographic information system (GIS) professionals to master GIS data quality and data management challenges and deliver new geodata services for advanced planning and operations applications.
EPRI's Geospatial Informatics research topics are peripheral in relation to ConEds staff's day-to-day work. Looking at our company's GIS through different eyes and seeing the potential to align our work with future GIS development.

Outage Data Standard to Improve Customer Engagement and Assist First Responders- Seattle City Light(2021)
EPRI led an industry effort to create standardized outage management status messages that have since been contributed to International Electrotechnical Commission (IEC) Standard 61968-3 as well as Multi-Speak. And has resulted in a growing international adoption referred to as the Outage Data Initiative.
"The Outage Data Initiative enabled Seattle City Light to share outage data so that other utilities and emergency management organizations can see it on their preferred platform. Together, we can create a common operating picture and improve our response when storms, fires, earthquakes or other disasters strike." Scott Thomsen, Sr. Strategic Advisor, Seattle City Light.

EPRI's Protocol Reference Guide Organizes Information for Utility Use Now and In Future Editions - Salt River Project (2021)
The Protocol Reference Guide answers frequently asked questions about information and protocol standards for distributed energy resources and demand response technologies. It is an important tool for stakeholders working with DER/DR technologies who want to learn more about the different options for standard protocols, information, and data models.
"EPRI's Protocol Reference Guide is helpful in communicating and educating the various departments within SRP on the many different attributes of DER protocols. This information helps all stakeholders get on the same page to better define requirements and next steps for DER integration." Kyle Cormier, Salt River Project



Success Stories 2024-2020
Information and Communication Technology (ICT)

EPRI Test Tools Support Advanced Testing - Ameren Services (2021)
IEEE 1547 and California Rule 21 is breaking new ground by requiring standardized communications interfaces in devices. Utilities need tools to evaluate these products and their capabilities to ensure they meet requirements. EPRI created test-tools to support implementation and testability of open protocols in solar, storage, and demand response technologies.
EPRI helped Ameren establish the Dorsett Inverter validation facility by defining priority use cases for utility and customer. Ameren also used the EPRI's openDERMS platform to conduct testing on virtual and physical DER assets in their lab. This allowed Ameren to achieve learn and demonstrate capabilities with minimal capital investment.

Enterprise Architecture Collaboration Group (EACG) Addresses Standards-based Integration - American Electric Power (2021)
Do standards-based interfaces (SBI) reduce operations and maintenance costs? It seems like SBI should reduce costs. As the EACG explored this topic they also compared SBI against other types of integration techniques, such as proprietary point-to-point, or using "adapters". Because the development norms may vary by organization, the EACG did not seek to be definitive, but rather to create a framework so that any utility could compare their own development costs, expectations, and patterns to compare the different integration approaches.
"This framework will provide a meaningful public benefit for architecture practitioner looking for tools to help quantify architecture debt, better understand where various integration techniques are cost effective, and help align the thinking of other interoperability efforts, such as the Grid Modernization Laboratory Consortium – Interoperability Project." Enterprise Architect at American Electric Power (AEP).

Digital Transformation: An Information Technology and Operations - Salt River Project (2021)
EPRI has been conducting research on information technology and operations (IT&O) convergence since 2014. The work has looked at strategy, critical success factors, cost-benefit analysis, portfolio management, and has been involved in conversations with thought leaders at the highest level of utility organizations. The model attempts to identify those attributes that a utility can invest in to see improved execution across IT&O domains, leveraging the leading practices of each, to achieve better outcomes related to projects and investments. Domains coincide with the categories of people, process, technology, and governance, and use a common "five tiers" maturity model that evolves from Level 1 – ad hoc, to Level 5, Industry Leading. EPRI, coordinating with utility subject matter experts (SMEs), and leveraging their prior maturity model experience, conducted three workshops: After a lively discussion at an advisory meeting on IT/OT convergence challenges,
EPRI took the lead in facilitating the creation of a digital transformation maturity model. This model is the result of a collaboration of numerous utilities and will be hugely valuable in helping us understand our maturity as an integrated IT/OT organization, and what we need to do to improve." Dawn Jurgensmeier, Information Technology Services Grid Modernization Services (ITS GMS) Salt River Project (SRP).

EPRI Wi-SUN Meter Test Tool Helps Xcel Energy and Ameren Test AMI Systems (2021)
Perfect interoperability is, so far, an unrealized ideal for the RF mesh devices used in Advanced Metering Infrastructure (AMI) networks. The Wi-SUN Alliance is trying to do for AMI communications what the Wi-Fi Alliance has done for Wi-Fi. Both are based on an underlying IEEE standard; IEEE 802.11 for Wi-Fi and IEEE 802.15.4g for Wi-SUN. EPRI has been helping to drive this effort through multiple projects.
"EPRI's participation in the Wi-SUN Alliance and the development of the reference implementation of the Wi-SUN stack are examples of EPRI's leadership in advancing standards-based solutions." Dan Nordell, Xcel Energy.

Success Stories 2024-2020
Information and Communication Technology (ICT)

Utilities Enhance Revenue Protection Processes Through the EPRI Leading Practice Guidebook - Exelon (2021)
This guidebook is aimed at helping utilities establish and improve revenue protection practices. Revenue protection refers to the broad set of processes that utilities employ to prevent, detect, and respond to energy theft and other energy unaccounted for. With the introduction of advanced "smart" metering technology more than a decade ago, utilities have been required to modify and broaden the methods and procedures they use to protect themselves from energy theft. A process that previously relied on physical visits, human labor, and training in inspection techniques is being replaced by one that is primarily based on digital sensors, remote readings, and analytic algorithms. "The opportunity to discuss revenue protection best practices with other utilities on a weekly basis encouraged Exelon to explore and utilize new methods and techniques to finding power theft." Paul Unruh, Exelon.

EPRI Field Area Network Research Project – Private LTE Guidebook and FAN Testing Platform - Ameren (2021)
Results from the Private LTE Guidebook provided insights on technology, spectrum options, and use cases to support business case development and investment decisions. Once the pilot project was underway, EPRI's FAN Testing Platform provided quantitative results to asses and verify the network performance.
EPRI's in-depth research helped us not only to make a decision to pursue private LTE, but during our pilot provided above and beyond support for doing unbiased bandwidth and latency testing that was critical for us to understand.

EPRI Wide Area Network Research Project – 6 GHz Microwave Interference- Southern Company (2021)
Results from field testing collaboration between EPRI and Southern Company have been instrumental in identifying and quantifying the issues posed by the FCC allowance of unlicensed operation in the 6 GHz band.
EPRI contributed immensely to the planning and execution of the testing, use-case parameters, and the results aided our regulatory filings. EPRI's expertise, knowledge and ingenuity made our real-world testing of unlicensed 6 GHz interference with licensed microwave possible. Their ability to sort out the immature Wi-Fi 6E technology and create working 6E networks for testing not only supported Southern Company but is also contributing to the entire microwave industry's testing and reporting in this area. Because of the partnership with EPRI, Southern Company is well positioned to have a deep knowledgebase and bench strength in areas we need assistance for years to come.

Geodata Informatics Guidebook Second Edition - Salt River Project & Lincoln Electric System (LES) (2021)
The GIS guidebook aims to prepare electric utility GIS professionals to deliver improved geodata services to an expanding spectrum of utility individuals and systems. The project is also intended to help GIS professionals understand how trends in the geospatial industry are affecting their management of geospatial information and investments.
GIS Guidebook – provides high value in operational point of view. Joint project work that is GIS related with P200 Distribution Operations & Planning. A lot of value if EPRI can successfully work with vendors and influence industry standards so that products are more off the shelf today. Successfully standing up new ADMS system and a test environment with our GIS data handler.

Digital Twin is Today's Utility GIS Opportunity White Paper- NYPA, Ameren and Exelon (2021)
Decarbonization and grid modernization require digital transformation at electric utilities. Readers of the Digital Twin is Today's Utility GIS Opportunity white paper will gain insights they can share and apply to realize the organizational benefits to help accelerate their utility's digital transformation.
Valuable to see more VR implementation in
GIS and providing virtual tours, therefore moving forward creating a virtual twin. Also, very valuable to see what other companies are doing in this space. Digital Twin Whitepaper applicability of this research and this new technology and the analysis that is performed in this research.

Successful Integrated Network Model Management | (2020)
The role of Network Models is becoming increasingly important in today's utility. Market and Grid operations are now intertwined in many control areas. New resource types and behaviors are appearing and the expectations for grid automation and efficiency are increasing. All of these require an accurate model of the grid that can be shared amongst applications and between operating companies (markets, transmission, distribution, microgrids and distributed energy resources). EPRI's Integrated Network Model Management (NMM) project uses EPRI reference architectures and those of the International Electrotechnical Commission (IEC) Common Information Model (CIM) to develop an in-depth understanding of the network model management issues and potential solutions. In 2020 EPRI worked with Hydro Quebec to analyze their current state of network model management in the distribution and transmission domains within the context of a complete overhaul of their network operations control centers and technology.

"The EPRI project has allowed Hydro-Québec Transport to demystify what centralized management of electrical models is all about. It also allowed us to put into words and images the internal problems related to the maintenance activities of our multiple models. As a result of this project, HQ is better equipped to establish a target vision of a future ecosystem of analysis tools powered by ONE centralized network model manager. The project has, moreover, allowed the establishment of a dialogue between the different fields (planning, operation, protection) of HQ Transmission knowing that the role of an NMM is not to replace each of the analysis tools, but to centralize the information in a logical way necessary to each of them." Martin Doré, Ing.Engineer Hydro Quebec.

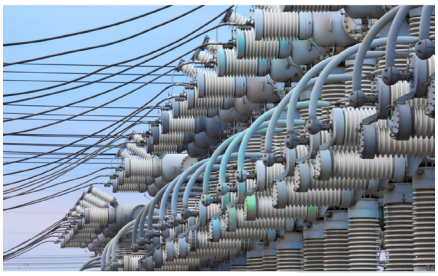
6 GHz Interference: Field Testing (2020)
The Federal Communications Commission (FCC) issued a Report and Order (R&O) in April 2020 that allows unlicensed devices (such as Wi-Fi) to operate in 6 GHz microwave radio bands that were previously exclusively licensed. This regulatory change introduces the possibility of harmful interference to existing microwave systems, including those used by utilities for SCADA, system control, and teleprotection. These microwave systems were not designed to deal with interference from unlicensed devices. Ameren and other utilities can utilize testing recommendations when making decisions about network upgrades, and maintenance of existing systems. It provides insights on what to look for when troubleshooting interface on their microwave links. Ameren can speak with more credibility about the harm unlicensed Wi-Fi devices will have on critical communications support grid management and coworker safety.
"EPRI's in-depth technical knowledge and expertise allowed Ameren to conduct multiple real-world test scenarios to document the impacts of potential interference to our licensed 6GHz microwave links, which are used for critical communications, caused by the FCC proposed 6GHz Wi-Fi solutions which are heading to market. Additionally, EPRI's flexibility to conduct this testing during a worldwide pandemic while maintaining the safety of both Ameren and EPRI personnel was extraordinary." Tim M. Spyers, P.E. Senior Technical Architect, Ameren Services.

Success Stories 2024-2020
Information and Communication Technology (ICT)

Common Substation Platform: Utility Requirements Survey (2019)

Substations are becoming more complex both in the power delivery aspects but also in terms of the need to handle wide ranging data services, communication between devices in the substation, devices in the field and back to the corporate data and control centers. In the past, a simple remote terminal unit was able to provide the needed functionality, however, with the continued emergence of inverter-based generation, micro grids and intelligent energy networks the need for robust, secure communications will expand. EPRI is investigating how to gather, manage, and use the data generated more effectively. This document describes how a member utility received value from the Common Substation Platform Utility Requirements Survey project.

"The Common Substation Platform: Utility Requirements Survey project was a necessary step in the process of determining the broad needs of the industry with regards to interfacing all the required data sources in the field securely and efficiently. More work needs to be done to fully define suitable architectures, computing platforms and other requirements. It is important that we leverage the expertise of our industry peers through effective collaboration and develop a solid roadmap toward implementation." Glen Wilson, Principal Research Engineer, PD T&S Southern Company – R&D



Supporting the Next Generation of DER Interoperability Standard (2019)

A key component of grid modernization is leveraging distributed resources, but the number of devices, makes, and models, including communications diversity from vendor solutions makes this difficult. The industry has spent considerable efforts to develop communications standards to allow power grid and customer systems to interoperate and interconnect with utility management systems. EPRI has made an impact to these efforts by providing research context that is important for embracing utility-focused use-cases and delivering key lessons learned from pilots, demonstrations, and other studies to scale adoption. This success story documents how collaboration helped an EPRI member company solve issues and implemented successful field testing of the CTA-2045 technology in load switches, thermostats, water heaters, mini-split HVACs, pool pumps and Electric Vehicle Chargers (EVSE).

"EPRI was instrumental in the success of Duke Energy's CTA-2045 demonstration project. EPRI worked with the participating utility members of the CTA-2045 collaborative to develop functional specifications, which map the CTA-2045 commands to the functionality of individual appliances to achieve customer-focused demand response. EPRI also assisted in the collaboration between the utilities, communication module manufacturers and appliance manufacturers, including developing tools for testing the communications between the devices. The contributions by EPRI helped Duke Energy identify and solve many issues during the lab testing phase of our demonstration. This enabled our successful field testing of CTA2045 technology in load switches, thermostats, water heaters, mini-split HVACs, pool pumps and Electric Vehicle Chargers (EVSE)." Mike Rowand Director, Technology Development Duke Energy.

Digital Transformation: An Information Technology and Operations Success Story (2019)

EPRI has been conducting research on information technology and operations convergence since 2014. At various times this research has reviewed the organizational pressures that have resulted from the convergence of skill sets and the need to align them for most modern utility projects. A member utility had a use case where the information technology and the operations staff could have been better aligned on some projects for improved performance. It was asked if EPRI, given their expertise in maturity models, could develop a model to better align information (IT) and operation technologies (OT).

"After a lively discussion at an advisory meeting on IT/OT convergence challenges, EPRI took the lead in facilitating the creation of a digital transformation maturity model. This model is the result of a collaboration of numerous utilities and will be hugely valuable in helping us understand our maturity as an integrated IT/OT organization, and what we need to do to improve." Dawn Jurgensmeier, Information Technology Services , Grid Modernization Services (ITS GMS) Salt River Project (SRP).

Success Stories 2024-2020
Information and Communication Technology (ICT)

Advanced Metering Infrastructure (AMI) Research helps to Understand and Maintain Industry Standard Knowledge (2019)

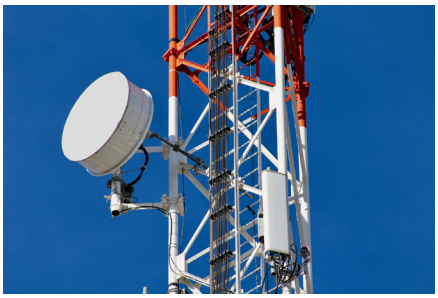
This success story documents from a member's prospective, how EPRI's AMI research is important to maintain knowledge and contributes to future development of interoperability standards. In 2019, EPRI hosted an AMI Task Force meeting at EPRI's facilities in Charlotte, North Carolina. The meeting, spread over two days, included participants from both utility and vendor communities to engage in a collaborative discussion what interoperability means in the context of AMI.

"At an AMI specific Southeastern Electric Exchange meeting in Ashville, N.C., Ed presented on the current state of specific standards that will help drive compatibility in future AMI systems. Without projects like Advanced Metering Systems, it would be difficult, if not impossible to maintain the standard knowledge. This research helps drive future standards to the goal of having interoperability among AMI systems." Derl Rhoades, Principal Engineer, Alabama Power.

Field Area Network Testing Platform Helps Utilities in Technology Selection Process (2019)

The Field Area Network (FAN) is an essential feature of the modernized grid, providing ubiquitous connectivity to an increasing number and variety of devices. Many utilities are deploying their first FAN or upgrading an existing FAN. The two pager outlines how a member utility conducted testing/ evaluation of radio systems for their FAN and how the results where valuable in making vendor selections.

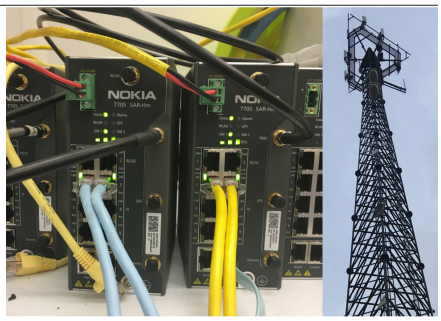
"During 2019, Portland General Electric was conducting testing and evaluation of radio systems for the Field Area Network (FAN). The EPRI FAN Testing Platform, which is developed as part of the 161G Telecom Project Set, was well suited to PGE's testing needs, providing in-depth automated testing of the radios for throughput and latency. EPRI provided assistance and guidance configuring and using the FAN test platform. The results were valuable to PGE in making the vendor selection for the PGE Field Area Network." Melvin Sam Charuvilayil, Substation & Grid Integration - Telecom Portland General Electric.



EPRI Research Helps Ameren with Private LTE Field Area Network (FAN) (2018)

Ameren used results from the EPRI Field Area Network (FAN) Demo, the Assessment of Licensed Spectrum, the Telecom Initiative and Project Set 161G to plan, develop, and deploy a private LTE network pilot. The pilot outcomes would shape final plan/build/ run plans. EPRI research identifies the importance of the FAN as a multi-services network instead of unsustainable single-purpose networks.

"EPRI's in-depth research helped us not only to make a decision to pursue private LTE, but during our pilot provided above and beyond support for doing unbiased bandwidth and latency testing that was critical for us to understand." C. Cole Crews, Career Engineer,NEO Strategy and Planning,Ameren Services

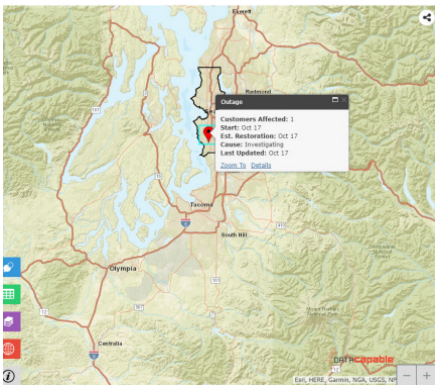


Success Stories 2024-2020
Information and Communication Technology (ICT)

A Case Study on the Implementation of Outage Data Standard to Improve Customer Engagement and Assist First Responders (2018)

A voluntary open standard for publishing power outage and restoration information was developed by EPRI in collaboration with utilities and governmental entities and included in the Common Information Model or CIM. This standard puts data that is already public in a common, structured format, empowering emergency management agencies, utilities, and other first responders with wide area situational awareness for extensive events. Seattle City Light adopted, implemented, and tested the ODI standard. The results of their pioneer effort benefitted internal operations and external communications by enhancing customer engagement and improving outage visualization for the utility.

"The Outage Data Initiative has enabled Seattle City Light to share its outage data so that other utilities and emergency management organizations can see it on their preferred platform. And the initiative is bringing other utilities together to do the same. Together, we can create a common operating picture and improve our response when storms, fires, earthquakes or other disasters strike." Scott Thomsen, Sr. Strategic Advisor, Seattle City Light



Applied Information Communication Technologies (ICT) for Transmission: Remote Device Management (2018)

Remote Device Management (RDM) is a process for collecting and organizing information about managed devices installed on electric utility assets to remotely acquire and modify intelligent electronic devices (IEDs) behavior. IEDs can include microprocessor relays, smart inverters, routers, switches and more. These IEDs fulfill a critical function by monitoring utility assets to provide the utilities with the data needed to operate the grid reliably, securely and efficiently. This success story describes Salt River Project's implementation of EPRI research and how the utility will continue to work with vendors in addressing existing gaps in their solutions to provide true Remote Device Management (RDM) beyond Interactive Remote Access (IRA).

"EPRI's work on Remote Device Management aligns with SRP's vision in managing Intelligent Electronic Devices (IEDs). Salt River Project (SRP) sees the capabilities of remote device management as key in being able to achieve more productivity with less resources. The results of the work performed by EPRI will be utilized as SRP continues to work with vendors in addressing existing gaps in their solutions to provide true Remote Device Management (RDM) beyond Interactive Remote Access (IRA)." Kyle Cormier, Manager – Control Engineering, Salt River Project.

Augmented Reality Training — Router Installation (2018)

Three utilities and EPRI evaluated an augmented reality (AR) tablet application to train field workers. The research and demonstration showed that AR training was faster than traditional training. Findings show the benefits of immersive mobile experiential learning. The possibilities of this type of training, especially the ability to immediately access additional visual instructions may prove effective for other field worker tasks. This technology could be used for situational awareness and as communications tool to reduce ambiguity in device status.

"AR/VR training and technologies demonstration shows ability to expedite training and thus workforce efficiency for Ameren." John Hughes, Ameren

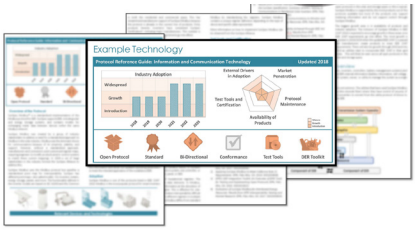
"The project-to-date research results have shown that worker's awareness of surroundings inside a substation can be enhanced with AR/VR technology thus leading to increased worker safety." Jason Autrey, Principal Engineer at Southern Company.

Success Stories 2024-2020
Information and Communication Technology (ICT)

EPRI's Protocol Reference Guide Organizes Information for Utility Use Now and In Future Editions (2018)

Utilities are exploring how distributed energy resources (DER)—including solar, storage, electric vehicles, and demand responsive loads—can be integrated into the electric grid as key components for maintaining a flexible, integrated grid. Communications capabilities and interoperability between DER are at the heart of many of these use cases because it allows for dynamic control, system analytics, and optimized dispatch —use cases of value to utilities. This success story documents how Salt River Project (SRP) utilized EPRI's Protocol Reference Guide (2018) as a reference document for stakeholders working with distributed energy resources and demand response technologies who want to learn more about the different options for application-layer protocols.

"EPRI's Protocol Reference Guide is helpful in communicating and educating the various departments within SRP on the many different attributes of DER protocols. This information helps all stakeholders get on the same page to better define requirements and next steps for DER integration."Kyle Cormier, Manager Engineering – Control Engineering, Salt River Project.



Enterprise Architecture Collaboration Group Addresses Standards-based Integration (2018)

Do standards-based interfaces (SBI) reduce operations and maintenance costs? That was the question that the EPRI Enterprise Architecture Collaboration Group (EACG) sought to address. There are a couple of characteristics of Informational SBI that suggest that costs can be reduced, for example, using a common semantic standard such as the Common Information Model (CIM), and using a predefined method for application integration. This framework could provide a meaningful public benefit for architecture practitioners looking for tools to better understand where various integration techniques are cost effective, and help align the thinking of other interoperability efforts, such as the Grid Modernization Laboratory Consortium – Interoperability Project

"This framework will provide a meaningful public benefit for architecture practitioners looking for tools to better understand where various integration techniques are cost effective, and help align the thinking of other interoperability efforts, such as the Grid Modernization Laboratory Consortium – Interoperability Project".Ron Cunningham, Enterprise Architect at American Electric Power (AEP), one of the key contributors to this effort.

EPRI Wi-SUN Meter Test Tool Helps Xcel Energy and Ameren Test AMI Systems (2018)

Currently, this interoperability scenario is an unrealized ideal for the RF mesh devices used in Advanced Metering Infrastructure (AMI) networks. The Wi-SUN Alliance is trying to do for AMI communications what the Wi-Fi Alliance has done for Wi-Fi. Both are based on an underlying IEEE standard; IEEE 802.11 for Wi-Fi and IEEE 802.15.4g for Wi-SUN. EPRI has been helping to drive this effort through multiple projects. Read how Ameren, Xcel Energy and EPRI successfully demonstrated two test tool communication.

"EPRI has long been a leader in promoting industry use of standards-based solutions for telecommunications. EPRI's participation in the Wi-SUN Alliance and the development of the reference implementation of the Wi-SUN stack are two examples of EPRI'S leadership in this area as is the work to educate and lead the industry toward the use of electric meter communication standards that will lead to interchangeable field devices. These efforts in particular will lead to more efficient and cost-effective field systems for years to come. Someday we'll be able to just plug in AMI communication devices with the same interoperability we enjoy with Wi-Fi today. Until then, the EPRI Wi-SUN Meter Test Tool fills an important function in improving AMI deployments and operations."Dan Nordell, Excel Energy

Success Stories 2024-2020
Information and Communication Technology (ICT)

Standard IEC 61850 — What does it not do? (2017)

In the mid-1990s, about 60 experts from 14 countries worked to create a single global and future proof standard for substation communications—Standard IEC 61850 – Communication networks and systems for power utility automation. As SRP explored opportunities in adopting this standard, it became apparent that some high-level education was required. EPRI provided an overview of the standard that helped various groups at SRP collaborate on the future of this standard within the utility. "As SRP explores opportunities in adopting IEC 61850, it became apparent that some high level education was required as everyone seemed to have a different understanding of what IEC 61850 is and how it could be utilized. After some discussion with Paul Myrda, he agreed to come out and provide SRP, a high level IEC 61850 overview. The overview was very helpful in not only educating the participants but also sparking conversation. Thanks to Paul for the support and the overview was definitely helpful in getting our groups on the same page as we collaborate on the future of IEC 61850 at SRP." Kyle Cormier, Manager – Control Engineering, Salt River Project.

Augmented Reality in Storm Damage Assessment Reduces Outage Duration (2017)

The emerging AR technology has the potential to create a revolutionary change in how data is collected, transmitted, and stored during storm assessment. The proof of concept project replaced the medium of paper and pencil to observe and capture the harm on assets inflicted by storms. Several technologies went into the user experience to assess a storm damage re-creation scenario including accurate Geospatial Information System (GIS) location, asset description standards. The application also used hands free data recording using natural voice commands to detail the damage through the use of an AR headset, and wireless transmission of data, pictures, or video to the warehouse and work crews to place the right assets at the right time at the right place to maximize the ability of the line worker in restoring the power.

"The main benefit of this app is its capability to collect the outage data from several different internal databases, combine them together, present it to the field damage assessment person on an AR/VR platform, and streamline and optimize the damage assessment process, minimizing the outage restoration times." Aleksandar Vukojevic, P.E., Duke Energy, Emerging Technology Office Manager – Technology Development

EPRI Test Tools Support Advanced Testing of Distributed Energy Resources (2017)

Grid codes and utility programs are increasingly requiring end-use devices and their control systems to use open standards. Grid codes like IEEE 1547 and California Rule 21 are breaking new ground by requiring standardized communications interfaces in their devices. Utilities need tools that can be used to evaluate these products and their capabilities to ensure they meet the requirements of RFPs and interconnection agreements. These tools also give utilities the capability to test uses for this new functionality in laboratory or field environments. To address this need, EPRI has created the EPRI DER Integration Toolkit. It is a series of test tools to support the implementation and testability of open protocols in both solar, storage, and demand response technologies.

"EPRI has been instrumental in helping Ameren establish our Dorsett Inverter validation facility and defining the use case which will benefit Ameren and our customers the greatest. The openDERMS 2.0 platform provided by EPRI facilitates the testing of both virtual and physical DER assets in our lab allowing us to achieve learnings and demonstrate capabilities with minimal capital investment." Clark Allen – IT Innovation Lead, Ameren

Enterprise Architecture Collaboration Group Addresses Standards-based Integration (2017)

The Enterprise Architecture Collaboration Group (EACG) addressed standards-based interfaces (SBI) to reduce operations and maintenance costs. The EACG also compared SBI against other types of integration techniques, such as proprietary point-to-point, or using "adapters." Additionally, the EACG reviewed several references and attempted to resolve the different interpretations and create a taxonomy of relationships between the terms in this domain to work towards a common interpretation. Finally, because the development norms may vary by organization, the EACG did not seek to be definitive, but rather to create a framework so that any utility could compare their own development costs, expectations, and patterns to compare the different integration approaches.

"This framework will provide a meaningful public benefit for architecture practitioners looking for tools to help quantify architecture debt, better understand where various integration techniques are cost effective, and help align the thinking of other interoperability efforts, such as the Grid Modernization Laboratory Consortium – Interoperability Project". Ron Cunningham, Enterprise Architect at American Electric Power (AEP),

Electric Power Research Institute
3420 Hillview Avenue, Palo Alto, California 94304-1338 • PO Box 10412, Palo Alto, California 94303-0813 USA
800.313.3774 • 650.855.2121 • askepri@epri.com • www.epri.com