# BENEFITS OF SMART GRID INTEROPERABILITY, August 2021

## INTRODUCTION

The electricity grid is changing. The National Institute of Standards and Technology (NIST) has indicated that operating a modern grid will involve a diverse portfolio of energy resources and multiple economic structures that will rely on, and ultimately benefit from, enhanced interoperability for technology and components of the system, which will unlock tremendous new value across the power system.[1]

According to the GridWise Architecture Council, there exist at least $10 billion in potential annual interoperability-derived savings available in the U.S. electric power industry. Considering all categories of interoperability benefits, the true value of interoperability is expected by many to be much higher than initial estimates.[2]

## SUMMARY OF BENEFITS CATEGORIES

Interoperability benefits span technical, economic, policy, and social systems, and can be conceptually understood using the seven categories below as a framework.

| *Category* | *Interoperability…* |
|---|---|
| **Resilience** | Enables modular and distributed resources that reduce outage events; improves cybersecurity and weather-event response among utilities; |
| **Safety** | Reduce stress on system; run assets more efficiently and provide more visibility into system operations and cybersecurity |
| **Affordability** | Extends the life of assets through ability to realign purpose to meet changing operating environment / needs or maintain existing functions and operations despite other system updates; Allows for replacement of components instead of entire systems; |
| **Reliability** | Facilitates better system monitoring, operations, and power quality; |
| **Policy** | Helps achieve social goals related to climate, energy, and access; |
| **Economy** | Supports local, regional, and national growth. |
| **Customer** | Enhanced customer empowerment by enabling customers to have direct role in grid transformation; Supports customer flexibility, customer-level resilience and the opportunity to deploy devices and management systems in support of customer, grid-level, and societal priorities. |

## PRACTITIONER PERSPECTIVES

### Interoperability Enhances Operational Resilience in Florida[3]

Hurricane Irma hit Florida in 2017 and resulted in disruptions in electric service. Utility companies can invest in, maintain, and upgrade automated systems for network protection, outage management, and restoration of service. Adding interoperability considerations to such systems comes with a cost, yet a paper published in 2021 revealed evidence that the number of interruption hours resulting from Hurricane Irma was lower in sections of Florida where utilities had made interoperability improvements to their distribution grids in those locations with all else equal. Interoperability improvements were measured by proxy based on penetration of advanced metering infrastructure. The study found that Florida counties that had invested in interoperability experienced $1.7 billion of operational resilience benefits due to avoidance of interruption to service.

### Interconnection Standards in Minnesota[4]

The Minnesota Public Utilities Commission undertook a process in 2016 to update Interconnection Standards for distributed energy resources (DER) to include the Institute of Electrical and Electronics Engineers (IEEE) 1547 standard. Formal assessment of DER interconnection via utility tariffs, with IEEE 1547 as a reference framework, allowed the Commission to ensure that DERs could be promoted for both the distribution system and bulk system with coordination across several entities: the DER operator, distribution system operator, transmission system operator, and regional transmission organization. Proper standards guide development of DERs of any size or amount without impairing grid reliability. The PUC also required utilities to conduct distribution system planning and grid modernization infrastructure planning so that there is routine assessment of the use of industry standards, and backward and forward capability with legacy and future utility systems to minimize long-term costs.

### Communications and Advanced Metering Infrastructure in Michigan[5]

The Michigan Public Service Commission oversaw a smart grid deployment for implementing a 200 MW demand response program based on ZigBee communication standards that would greatly improve outcomes of a program built around interruptible air conditioners. ZigBee communication functions as part of Advanced Metering Infrastructure (AMI), and guides a home area network for communication between homes and devices and the utility company. The ZigBee Alliance independently certifies and verifies ZigBee products to ensure they will work, helping utilities and grid operators make effective, field-informed decisions.

### Future Proofing Grid Investments in Tennessee[6]

EPB Chattanooga is a municipal utility in Tennessee with 500,000 customers that deployed smart switches to better isolate outages. The switches therefore provide significant resilience benefits, while having been designed with interoperability as a criterion, so that future technology in the system can be incorporated. Project implementation ran parallel with installation of fiber optic cable throughout the service territory, which will be accessible for future communications projects in other domains. With respect to the electric grid, the smart switches are able to monitor current and voltage in both directions, and settings are adjustable so that system protection schemes can be easily adjusted. Communications software elements of the system are designed to be upgradable or replaceable while the hardware can remain in place.

**REPORTS ON INTEROPERABILITY FOR THE SMART GRID**


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