



TIP 25b: EPRI P37: Testing Guidelines and Utility Practices for Multi-Vendor Equipment and Systems Based on IEC 61850 Standard – Phase II

Context

Next-generation substations will use advanced communication infrastructure and protocols to allow interoperability for multivendor intelligent electronic devices (IEDs) and provide advanced features for protection, control, and automation.

IEC 61850 is a standard for the design of electrical substation automation. IEC61850 is an important new international standard for substation automation that will have a very significant impact on how electric power systems are designed and built for many years to come. IEC61850 is a part of the International Electro technical Commission's (IEC) Technical Committee 57 (TC57) architecture for electric power systems. IEC 61850 is a world-wide accepted standard for Ethernet-based communication in substations

The standard not only enables interoperability by providing a standardized framework for substation components and communications, but also introduces new features, such as station bus and process bus, to innovate current substation practices and reduce project costs.

Description

The IEC 61850 standard is complex and feature-rich. The standard and associated technologies offer breakthrough innovations in support of self-monitoring and comprehensive event reporting capabilities that may allow utilities to detect system hidden failures, reduce unnecessary maintenance activities, and extend maintenance intervals under the NERC PRC-005-02 Protection System Maintenance standard.

The project addresses the high cost, long outage, and inefficient method of replacing or refurbishing substation protection, control, and data equipment during the substation lifecycle. Utilities that have implemented the 61850 standard have experienced a 90% reduction in wiring required for control and indication. Utilities have also experienced lower equipment, design, construction, maintenance, and documentation costs.

Throughout the project, collaboration across the major stakeholders is thought to be the key to addressing the issues and come up with solutions. The proposed research, through a phased approach, will collaborate with utility users, vendors, IEC working groups and subject-matter experts. The state-of-the-art multi-vendor digital relays and communication facilities in EPRI laboratories will be used to research, develop and demonstrate the concepts, principles, tools and solutions that can be applied by utilities in function specification, engineering design, acceptance testing, commissioning and maintenance.

The project will concentrate on the following tasks:

- Collaborate with Utilities to Develop a Function Specification on Facilitating System Expansion for IEC 61850 based Protection and Control Systems.
- Collaborate with Utilities to Develop a Function Specification on Performing Initial Field Commissioning for IEC 61850 based Protection and Control Systems.
- Collaborate with Utilities to Develop a Function Specification on Condition Base Maintenance (CBM) to Reduce Intrusive Testing and Maintenance Needs for IEC 61850 based Protection and Control Systems in Substations
- R&D on Advanced Monitoring and Diagnosis Capability to Facilitate Condition Based Maintenance in the IEC 61850 System Environment.
- Demonstrate the New CBM Methodology and Approaches Defined in the Standard Edition 2
- Perform Technology Transfer
- Collect and document the requirements and practical needs from utility end users, and present to the IEC 61850 standard working groups and product manufacturers for improvement and future development
- Development of report on Software Tools for Implementing and Maintaining IEC 61850 This task will develop a technical report that documents functional requirements, gap analysis and action plan for IEC 61850 software tools.
- Development a report on 61850 Security and Compliance. This task will develop a technical Report that summarizes the gaps and issues for securing IEC 61850.

Why It Matters

This project provides substantial new learning in application and deployment of the IEC 61850 standard for next-generation substation development. The work is in support of National Institute of Standards and Technology (NIST) SGIP (Smart Grid Interoperability Panel) testing and conformance committee activities and contribute to the maturity of the IEC 61850 standard. It will benefit the public in that it provides an important step in achieving the smart grid specified in the 2007 Energy Independence and Security Act. This act clearly described the benefits to society of a smart grid and the application of interoperability standards, such as IEC 61850, which is a key aspect of migrating today's power system infrastructure to a smart grid.

Goals and Objectives

The goal of this project is to research and develop testing guidelines that can be used in the field to assist in function and performance testing for multivendor equipment and systems based on the IEC 61850 standard.

The objective of the project is to address the barriers in planning, implementing, operating and maintaining the IEC 61850 standard and associated technologies by:

- capturing lessons learned from utility implementations
- developing education and training material
- developing guidebook and software tools
- addressing security challenges

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Reports & References (Optional)

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Links (Optional)

Participating Organizations

Electric Power Research Institute
Con Edison
Hydro One
New York Power Authority

