Supplemental Project Notice

TECHNOLOGY ASSESSMENT AND DEMONSTRATION OF PROCESS BUS AND NON-CONVENTIONAL INSTRUMENT TRANSFORMER (PHASE 3)

PROJECT HIGHLIGHTS

- Advance digital substations by replacing copper-based control cables with fiber-optic communication technologies
- Improve safety and enhance EMP/EMI hardening
- Evaluate different process bus technologies for members to make informed decision
- Keep members updated of technology innovations in Non-Conventional Instrument Transformers (NCITs)
- Technology transfer through hands-on workshop and lab demonstration

Background, Objectives, and New Learnings

As utilities drive to modernize substations and implement advanced digital technologies to enhance reliability, improve safety, simplify installation and operation, and reduce costs, the role of the fundamental measurement technologies begins to shift. Process bus, which provides a new digital interface for conventional instrument transformer or Non-Conventional Instrument Transformer (NCIT) through fiber optic communication, is a key enabling technology for digital substations.

The previous EPRI research, through technology assessment and lab testing, revealed that:

- Process bus can be implemented using various technologies; and interoperability can be achieved through industry standards.
- The performance of Protection & Control (P&C) functions using process bus is largely dependent on specific technologies and vendors.
- Precision time synchronization is critical for network-centric process bus technologies, as losing time source(s) could impact protection functions.

The research project, in the current phase, aims to:

- Collaborate with industry stakeholders to explore new technologies addressing the precision time synchronization requirements for process bus.
- Perform technology assessment and independent laboratory testing of process bus solutions to support members in field deployment.
- Provide technology transfer through hands-on workshops and webex-based trainings.
- Keep utilities updated on the latest technologies and industry standards related to process bus and non-conventional instrument transformers.

The commercial products, including protective relays, communication networks, merging units, and the state-of-the-art testing equipment at EPRI P&C laboratory will be used for testing, evaluation, demonstration, and technology transfer of new concepts, approaches, tools and designs that can be readily applied by utilities.

The project outcomes may provide utilities with new in-depth learnings of process bus and NCITs technologies. The R&D results may assist utilities in specification, engineering, application and deployment of new generation of protection & control and digital substations.

Benefits

The anticipated benefits of the new technologies include:

- Digitalize substation and reduce the amount of copper cabling needed
- Improve safety for personnel
- Reduce vulnerability to Electromagnetic Pulse (EMP) and Electromagnetic Interference (EMI)
- Reduce O&M cost and substation environmental footprint
- Enable modular or centralized new protection and control designs

Project Approach and Summary

This research plans to take the following approaches:

- Track, catalog, and analysis of new industry standards and technology development related to process bus and NCITs.
- Develop purpose-built testbed systems, in collaboration with manufacturers and SMEs, for research, development, and demonstration.
- Develop robust test plans and conduct independent lab testing. The planned tasks include equipment interoperability assessment, protection performance testing, communication network stress testing, and solutions for precision time synchronization.
- Document test results and research findings in a technical report.
- Engage utilities and industry stakeholders in hands-on workshops to facilitate industry collaborations and address technical barriers.

Deliverables

- A technical presentation summarizing research findings and results from technology assessment and lab testing.
- A testbed system at EPRI's P&C lab for research, development, and demonstration.
- Hands-on technology transfer at EPRI P&C lab in Charlotte, North Carolina.
- Quarterly webcasts with the project funders.

Price of Project

The cost to participate phase 3 of the project is $80k per participant. This project qualifies for self-directed fund (SDF) or cofounding.

Project Status and Schedule

The project phase 3 is anticipated to complete in 24 months.

Who Should Join

Utilities interested to deploy process bus, NCITs, and digital substation technologies.

Contact Information

For more information, contact the EPRI Customer Assistance Center at 800.313.3774 (askepri@epri.com).

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Product ID: 3002030540 **Project ID:** 1-119852 **October 2024**

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