Technology Innovation Project

Project Brief

TIP 249: System for Improved Monitoring and Assessment of Power System Operations and Equipment

Context

The problem of effectively measuring energy operations is endemic to all power systems. But electrical power systems are operated with a relatively higher level of ignorance when compared to other significant industrial and technology processes, notably limiting the ability to realize high levels of efficiency and to effectively deploy new, variable technologies (such as renewable generation sources). Without accurate measurements of what is happening real time in equipment and operations, energy resources cannot be optimally managed. This project offers measurements of critical electrical power system phenomena with significantly higher levels of accuracy, in actual real-time field operations, than those achieved by other monitoring techniques and technologies, along with a more detailed historic database. It also asserts the ability to measure other crucial system equipment properties such as temperature, pressure/acoustics, and – uniquely – material strain that can be highly useful for predicting future system functioning. The key to this professed accuracy is advanced fiber optic sensors deemed robust enough to provide precise real-time data in the harsh, high-voltage environment. All this enhanced data is to be processed using standard protocols and interfaces for data communications, both wireless and wired.

Description

The primary objective of this project is to demonstrate a cost-effective monitoring solution delivering accurate, reliable information supporting a wide range of predictive analyses and fault detection. This enables improvements in the data employed for applications, from phasor measurement to asset maintenance to providing the information necessary to the effective application of power electronics, helping to improve service delivery, asset longevity and productivity. Using optical sensors developed by the United States Navy and licensed by SmartSenseCom (SSC), the monitoring solution delivers continuous, highly accurate measurements of temperature, pressure/acoustics, and material strain, as well as current/voltage and related electrical phenomena. It stores these measurements in the field for onsite assessments of equipment and operations, and also provides routine, real-time reporting of the measurements to central management facilities. As such, SSC believes that its Intelligent Monitoring Solution fills gaps identified in T15, T10 and T2 of the Bonneville Transmission Roadmap. SSC will undertake six tasks, including installation of the solution at one generating facility and one transmission substation, over a period of 12 months, to enable BPA to assess the monitoring platform. The project will conclude with an assessment of the demonstration results and a final report.

Why It Matters

Monitoring equipment and operations at the level of accuracy and granularity proposed here, with inherent abilities to begin to build the data bases necessary for effective trend analysis and load management, will provide one of the key building blocks for more effective operation and control of high-voltage power systems in the emerging world of renewable and distributed sources and new, less-predictable loads. The application of accurate information for asset management alone should lead to percentage point improvements in the annual cost of operation of any power system. Coupled with new and developing operating control systems, this level of information should lead to efficiency improvements substantially greater than the improvements projected for demand-side “smart grid” applications. Demand side will always be dependent upon customer behavior; in contrast, improvements in supply-side efficiency will be realized no matter how the customer behaves or what the delivered source of the electricity. Like any new technology application, however, the benefits will come over time, as the information permits better understanding of equipment performance and actual system operations.

Goals and Objectives

1. Measurements of key phenomena with significantly higher levels of accuracy, in actual field operations, than those achieved by other monitoring techniques.
2. A more detailed historic data base, both at the point of operations and at central monitoring and control locations.
3. More detailed real-time data.
4. Demonstration of a significant, long-term price/performance advantage for the monitoring platform.
5. Demonstration of technological robustness.

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Deliverables

1. Task 1 Deliverables.
   a. Project calendar
   b. Complete system specification, including site locations, number and type of sensors, required communications equipment and overall test parameters
   c. Testing of sensors and their connections in the BPA High Voltage Lab to assure no adverse effect on equipment or operations
   d. Written equipment installation plan, including time frame, required resources and potential contingencies
2. Task 2 Deliverables
   a. Completed sensors and systems for installation, manufactured to specification from Task 1
   b. Written site test and systems documentation
3. Task 3 Deliverables
   a. Successfully installed sensors and communications equipment according the installation plan developed in Task 1
4. Task 4 Deliverables
   a. Field tested and calibrated equipment according the specifications developed in Task 1
   b. As-built drawings and maintenance plan
   c. Written acceptance of the system by BPA
5. Task 5 Deliverables
   a. Continuous information on the status of the monitored equipment as outlined in the test parameters developed in Task 1. This will be electronic data delivered in the form determined in the overall specification developed in Task 1.
   b. Weekly summary reports and conference calls during the first month of testing
   c. Bi-weekly summary reports and conference calls during months two through four of testing
6. Task 6 Deliverables
   a. Management presentation on the results of the overall project and recommendations for further implementation of the Intelligent Monitoring Solution
   b. Comprehensive Final Written Report and Recommendations.

Project Start Date: October 2011

Project End Date: October 2012

Funding

Total Project Cost:	$629,750
BPA Share:	$282,090
External Share:	$347,660
BPA FY2012 Budget:	$282,090

Participating Organizations

SmartSenseCom

For More Information Contact

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