American Transmission Company

Phasor Measurement Unit Project

Abstract

American Transmission Company's (ATC) Phasor Measurement Unit Project is deploying synchrophasor technologies across the company's Wisconsin service area. The project expands the collection of synchrophasor data throughout ATC's transmission system from 25 substations to 73 substations by project completion. ATC is using synchrophasor monitoring to improve electric system reliability and restoration procedures and to help prevent the spread of local outages to neighboring regions. The project deploys phasor measurement units (PMUs), digital fault recorders (DFRs), a new synchrophasor data concentrator, and improved data collection software. These devices increase the ability of grid operators to monitor the condition of bulk power systems in near-real time, enable earlier detection of conditions that could result in grid instability or outages, and facilitate the sharing of information with neighboring regional control areas.

Smart Grid Features

Communications infrastructure includes data collection systems for acquisition and delivery of data from field PMUs or DFRs to phasor data concentrators and control center computers for visualization and display for grid operators. This project is associated with ATC's Enhanced Supervisory Control and Data Acquisition and PMU Communications Backbone Project, another project funded through the SGIG program.

A wide-area monitoring, visualization and control system enables a more expansive view of the bulk transmission system, while revealing dynamic operating details. The project consists of two approaches, which are complementary. Approach 1 consists of installing standalone phasor measurement equipment at site locations that do not have DFRs currently installed. Approach 2 consist of upgrading existing DFRs to give them PMU functionality. These two approaches act as the primary collection devices at 48 substation sites within ATC's transmission footprint, which totals 60 data collection points. A new phasor data concentrator collects, stores, and analyzes data from the new PMUs and DFRs. Expanded data from the PMUs and DFRs enable transmission operators to identify grid disturbances, congestion, and losses at an early and localized stage. Enhanced monitoring capabilities allow better precision in the daily operational decision-making of grid operators. The goal is to use this capability in the future to help avoid transmission congestion and improve overall transmission reliability.

At-A-Glance

Recipient: American Transmission Company

State: Wisconsin

NERC Region: Midwest Reliability Organization

Total Budget: $2,661,650

Federal Share: $1,330,825

Project Type: Electric Transmission Systems

Equipment

- **48 Phasor Measurement Units***
- **1 Phasor Data Concentrator**
- **Synchrophasor Communications Network**

* Represents 60 data collection points at 48 substations

Advanced Transmission Applications

- **Angle/Frequency Monitoring**
- **Post-Mortem Analysis**
- **State Estimation**
- **Steady-State Model Benchmarking**

Key Targeted Benefits

- **Improved Electric Service Reliability**
- **Reduced Congestion Cost**
- **Reduced Costs from Transmission Line Losses**
- **Reduced Electricity Costs for Customers**
- **Reduced Operating and Maintenance Costs**
- **Reduced Wide-Scale Blackouts**

American Transmission Company *(continued)*

Through the project, ATC is implementing ***advanced transmission applications*** for the synchrophasor system, including:

- **Angle/frequency monitoring** provides grid operators and engineers with detailed information about grid conditions and power flows.
- **Post-mortem analysis** enables power system engineers and grid operators to analyze disturbances and large-scale system events, to better understand their causes and to improve future system models and operations.
- **State estimation** addresses parts of the transmission grid that lack physical monitoring to improve accuracy of power systems models for planning and operations.
- **Steady-state model benchmarking** increases the accuracy of power systems models for planning and operations.

Timeline

Key Milestones	Target Dates
PMU system installation start	Q1 2011
PMU system installation complete	Q3 2012

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