

## PJM Interconnection, LLC

### *PJM SynchroPhasor Technology Deployment Project*

#### Abstract

PJM Interconnection, LLC (PJM) and 12 of its member transmission owners are deploying synchrophasor measurement devices in 81 of its high-voltage substations and are implementing a robust data collection network. This project complements existing equipment to provide the necessary information technology infrastructure and wide-area monitoring and coverage of the PJM system to support further development of more advanced applications. The project is aimed at improving electric system reliability and restoration procedures, and preventing the spread of local outages to neighboring regions. The project deploys phasor measurement units, phasor data concentrators, communication systems, and advanced transmission software applications. These devices increase grid operators' visibility of bulk power system conditions in near real time, enable earlier detection of problems that threaten grid stability or cause outages, and facilitate information sharing with neighboring control areas. Access to better system operating information allows PJM engineers to improve power system models and analysis tools for better reliability and operating efficiency.

#### Smart Grid Features

This project involves an advanced ***wide-area monitoring and visualization system*** that provides a more expansive view of the bulk transmission system while revealing dynamic operating details that were previously unavailable. These improvements help optimize dispatch of power plants while improving system reliability.

***Communications infrastructure*** enables data communication between the phasor measurement units and phasor data concentrators of each transmission owner in the PJM region and the PJM grid operator. The infrastructure enhances the capabilities of PJM's Super Phasor Data Concentrator to meet the specifications of the proposed system and, with support from each transmission owner, establishes communications between the Super Phasor Data Concentrator and the phasor data concentrators of each transmission owner. The communication network uses redundant infrastructure through multiple telecommunication providers and network devices to ensure data delivery.

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

- **Angle and frequency monitoring** provides grid operators and engineers with detailed information about grid conditions and power flow.

#### At-A-Glance

**Recipient:** PJM Interconnection, LLC

**States:** DE, IL, IN, MD, MI, NJ, OH, PA, VA, and WV

**NERC Regions:** ReliabilityFirst Corporation and SERC Reliability Corporation

**Total Budget:** \$27,840,072

**Federal Share:** \$13,698,091

**Transmission Owners:** Allegheny Power, American Electric Power, Baltimore Gas & Electric, Commonwealth Edison, Duquesne Light, FirstEnergy Services, PECO Energy, PEPCO Holdings, Inc., PPL Electric Utilities, Public Service Electric & Gas, Rockland Electric, Virginia Electric & Power

**Project Type:** Electric Transmission Systems

#### Equipment

- 81 Phasor Measurement Units
- 17 Phasor Data Concentrators (company-level)
- Super Data Concentrator (PJM)
- Synchrophasor Communications Network

#### Advanced Transmission Applications

- Angle and Frequency Monitoring
- Disturbance Analysis
- Wide-Area Monitoring
- Oscillation Detection and Analysis

#### Key Targeted Benefits

- Increased Electric Service Reliability
- Optimized Generator Operation

**PJM Interconnection, LLC** *(continued)*

- **Disturbance analysis** provides operators with the ability to visualize historical data trends, obtain temporal and spatial information about the disturbance, and assess the impact on system reliability and the root cause of the disturbance.
- **Wide-area monitoring** provides PJM with additional visibility of the regional bulk transmission system. This enables better understanding of changes to system conditions.
- **Oscillation monitoring** allows PJM grid operators and engineers to observe power system disturbances and oscillations and to understand the impact of these conditions on the reliability of the grid.

**Timeline**

Key Milestones	Target Dates
Installation of data management, visualization, and operational data analysis software completed	Q2 2011
Final system testing completed	Q1 2013
PMU system deployment completed	Q2 2013

**Contact Information**

William Walker  
PJM Interconnection, LLC  
walkew@pjm.com  
www.pjm.com/