

## Duke Energy

### *PMU Deployment in the Carolinas with Communication System Modernization*

#### Abstract

Duke Energy's (Duke) phasor measurement unit (PMU) deployment in the Carolinas with communication system modernization project upgrades the existing serial-based communications infrastructure across the Carolinas. This includes the installation of PMUs and phasor data concentrators. An update to the existing energy management systems will be performed, along with visualization software to provide enhanced situational awareness for grid operators. Fifty-one substations across the Carolinas, at the 230 KV and 500 KV levels, are targeted to have the communications upgrade and approximately two PMUs planned per substation. PMUs provide high-resolution monitoring that improves grid operators' ability to visualize and manage the transmission system, improving reliability and grid operations.

#### Smart Grid Features

**Communications infrastructure** includes the upgrade of existing serial communications systems to internet protocol-based communications at Duke substations to deliver PMU data to phasor data concentrators and on to Duke's grid control center.

**Wide-area monitoring and visualization systems** enable a more expansive view of the bulk transmission system, while revealing dynamic operating details. Observing the nature of grid disturbances earlier, and more precisely, helps grid operators improve grid reliability and prevent the local disturbances from cascading into regional outages. Enhanced monitoring capabilities provide greater precision in daily operational decision-making, and improve overall system utilization and efficiency.

**Advanced transmission applications** for the synchrophasor system include:

- **Angle and 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.
- **Improved 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.

#### At-A-Glance

**Recipient:** Duke Energy Carolinas

**State:** North Carolina, South Carolina

**NERC Region:** SERC Reliability Corporation

**Total Budget:** \$7,855,797

**Federal Share:** \$3,927,899

**Project Type:** Electric Transmission Systems

#### Equipment

- 102 Phasor Measurement Units
- 2 Phasor Data Concentrators
- Transmission Systems Communication Equipment

#### Advanced Transmission Applications

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

#### Key Targeted Benefits

- Improved Electric Service Reliability and Power Quality
- Reduced Wide-Scale Blackouts

**Duke Energy** *(continued)*

**Timeline**

Key Milestones	Target Dates
Communications system deployment begins	Q1 2010
Phasor measurement system installation begins	Q3 2010
Communications system deployment complete	Q2 2013
Phasor measurement system installation complete	Q2 2013

**Contact Information**

Stephen G. DeGange  
 Carolinas Project Control Coordinator  
 Duke Energy  
 Stephen.Degange@duke-energy.com