

## Southern Company Services, Inc.

### Smart Grid Project

#### Scope of Work

Southern Company Services' (Southern Company's) Smart Grid Project involved integrated upgrades of the distribution, transmission, and grid management systems throughout the company's large service territory. Primary efforts included automation of significant sections of the distribution system and selected transmission lines, and installing smart monitors and relays in over 350 substations.

#### Objectives

The project included the deployment of new distribution technologies intended to improve the power factor at delivery and to support the ability to lower system voltage at peak load. This reduction in voltage and line losses, in turn, leads to peak load reduction, deferral of new generation capacity investments, and associated reductions in greenhouse gas emissions. New distribution and transmission automation equipment enhances system reliability through better protections and faster responses to outages, while simultaneously lowering operations and maintenance costs. Equipment health monitors installed in substations will reduce maintenance expenses and reduce failures.

#### Deployed Smart Grid Technologies

- **Communications infrastructure:** The project installed new radio communications equipment and upgraded the outage management, distribution management, and supervisory control and data acquisition (SCADA) systems. A total of 141 radio towers were installed using the SCADA platform to enable real-time transmission and distribution monitoring capability for grid operators. These upgraded SCADA communications network and software platforms have enhanced grid operators' visibility into the state of the grid and their ability to react to outages and disturbances.
- **Distribution automation systems:** Of the utility's 4,706 circuits, 2,081 received new automation equipment, including automated feeder switches, regulator controls, monitors, relays, and remote fault indicators. This equipment collects and coordinates sensor data throughout the distribution grid to automatically manage power quality, avert power disturbances, and isolate outages quickly.

#### At-A-Glance

**Recipient:** Southern Company Services

**State:** Alabama, Florida, Georgia, and Mississippi

**NERC Region:** SERC Reliability Corporation

**Total Project Cost:** \$362,593,709

**Total Federal Share:** \$164,527,160

**Project Type:** Electric Distribution Systems  
Electric Transmission Systems

#### Equipment

- **Distribution Automation Equipment for 2,081 out of 4,706 Circuits**
  - Distribution Management System
  - Equipment Condition Monitors
  - Automated Distribution Circuit Switches
  - Automated Capacitors
  - Automated Voltage Regulators
- **Substation Automation Equipment for 359 out of 3,325 Substations**
  - SCADA Communications Network
  - Smart Relays

#### Key Benefits

- Deferred Investment in Generation Capacity Expansion
- Improved Electric Service Reliability and Power Quality
- Reduced Operating and Maintenance Costs
- Reduced Costs from Equipment Failures and Distribution Line Losses
- Reduced Truck Fleet Fuel Usage

**Southern Company Services, Inc.** (continued)

- **Distribution system energy efficiency improvements:** Automated capacitors and voltage regulators have been integrated with a capacitor health monitoring system. The capacitors improve volt/VAR control, and power quality, as well as increase distribution capacity by reducing losses on the system.
- **Transmission system automation:** The project installed 545 automated switches along transmission lines as well as new monitors, relays, and breakers at 359 substations. This equipment allows Southern Company to better monitor the transmission network, react quickly to developing power disturbances, and isolate serious power outages before cascading effects occur.

**Benefits Realized**

- **Deferred investment in generation capacity expansion:** The Conservation Voltage Reduction (CVR) program has enabled the deferment of 400 MW's of generation. Additionally, losses have been reduced by a total of 2.65 megawatts (MW), resulting in a savings of 16,735 megawatt hours (MWh) from project initiation to September 2014.
- **Improved electric service reliability and power quality:** The System Average Interruption Frequency and Duration Indices (SAIFI and SAIDI) on distribution circuits have improved by 33.7% and 35.1%, respectively, as compared to the baseline performance (the three-year average performance prior to SGIG project initiation).
- **Reduced operating and maintenance costs:** The utility has realized overall operating and maintenance savings of \$6,241,786.
- **Reduced truck fleet fuel usage:** Since project initiation, Southern Company has avoided a total of 102,019 vehicle trips, resulting in 1,157,215 fewer miles driven. These reductions reduce associated operating costs and greenhouse gas emissions.

**Lessons Learned**

- Addition of distribution and transmission automation has resulted in improved reliability performance. Numerous instances have occurred where equipment installed through the project has resulted in avoided or reduced outage times.
- Capacitor monitoring has resulted in increased equipment reliability and real-time equipment failure notification. This is a much improved process over annual inspections.
- The use of centralized restoration gateways has provided for increased functionality of automatic restoration schemes over peer-to-peer systems.
- Distribution conservation voltage reduction programs have delivered results consistent with the theoretical results predicted in the project.

**Future Plans**

- Southern Company will continue to expand its Smart Grid program at the "speed of value" – the benefits to consumers of a new smart grid application should exceed the cost of integrating it into the grid.
- Southern Company will continue to evaluate the impact of project deliverables to determine future increased integration into the electrical grid. The following initiatives are under consideration for continuation:
  - Modernize the transmission system by upgrading relaying and adding digital fault recorders
  - Expand the installation of automated line switches on transmission and distribution lines
  - Expand automatic fault isolation and service restoration schemes on the distribution system

**Southern Company Services, Inc.** *(continued)*

- Southern Company plans to leverage data from smart devices and an existing (pre- SGIG project) advanced metering infrastructure to provide value to customers through data analytics initiatives.

**Contact Information**

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