Duke Energy Carolinas
Smart Grid Investment Grant Update

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NASPI Work Group Meeting
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Project participants

• Duke Energy Carolinas
  – Project manager
    • Tim Bradberry (Tim.Bradberry@Duke-Energy.com)

• Vendors
  – Alstom
Project Infrastructure Overview - PMUs

• Phasor Measurement Units
  – 125-150 total (usually 2 per substation)
  – SEL 351A or SEL 421
  – Sited on selected lines at all 230 & 500kV substations
  – Currently have approximately 15 PMUs installed at 6 substations
  – Total installation timeline is 3 years (completed by May 2013)
Project Infrastructure Overview - PDCs

• Phasor Data Concentrators
  – Key functionality is logging for stimulus reporting (meta-data such as performance, availability, etc)
  – OpenPDC Commercialized by Alstom
Project Infrastructure Overview - PGs

• Phasor gateways
  – Waiting for commercialized options
  – Industry-wide standards need to be finalized (NASPINet)
Most Important Synchrophasor Applications

• Improved State Estimator
  – Incorporates Phasor Measurements
  – Data inputs are SCADA (status points) and phasors
  – Provides data to EMS and other Network Applications

• Wide Area Visualization
  – Turns large amount of data into useful information for operator
  – Data inputs from EMS and phasors

• Post Event Analysis
  – Provides granularity for event analysis
  – Data inputs include phasor measurements and system models
Most Important Synchrophasor Applications

• Implementation
  – Dependent on Vendor Development
  – Expect production grade by end of 2012
  – No custom applications

• Value to Reliability/Efficiency
  – State Estimation and Wide-Area Visualization are necessary to provide a true snapshot of the system, more accurate data should lead to more reliable operation
  – Post Event Analysis helps to identify root causes, verify protections settings, and potentially reduce the number of future events
Most Important Synchrophasor Applications

• Training for Operators and Users
  – State Estimation
    • Operators should not see a change in performance, will have to be trained to interpret new data
    • Users and Support will have vendor training
  – Wide Area Visualization
    • Operators will be trained through Approved NERC System Operator Training and the Simulator
  – Post Event Analysis
    • Operators will not see this tool
    • Users and Support will have vendor training
Security Approach

• Maintain and continuously review NERC physical & cyber-security requirements

• Stand-alone PMU devices
  – Parts Availability
  – Maintenance Concerns (Human Factors Errors)
  – Cyber-Security Recommendation

• Separate communications pathways
  – Phasor data comes back on separate VLAN than SCADA data
Communications Approach

• Using standard synchrophasor protocols to ensure compatibility and interoperability with other utilities and NASPI

• Utilizing our own private network, a focus of the project is upgrading communications infrastructure from Serial to IP.

• Testing effectiveness and security through internal audits, risk assessments, etc. (details are confidential)
Project Challenges

• Overall Challenges
  – Coordination required for all internal groups (normal work continues)
  – Lack of production-grade applications and standards leave the details of the path forward somewhat obscured

• Communications Architecture and Data Flow Challenges
  – NASPINet not concrete
  – Lack of industry standardization
Other Comments

• Some issues due to new technology have not yet been discovered and resolved
  – Parts availability after scoping project
  – Device compatibility after installation

• PMUs will eventually have a positive impact in operation of the system, but sometimes have negative impacts at installation
  – Ensuring phases align across utilities and bad phasor detection for State Estimator performance
  – Determining storage requirements for data archival (a single PMU at 30x per second created performance issues for a PI server)
NASPI Support

• What can NASPI (as a community) do to support your project?
  – Drive standardization across the industry
  – Encourage development of tools and training
  – Continue to provide a forum for industry members going through the PMU installation process
Contacts

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