



U.S. Department of Energy

Office of Electricity Delivery and Energy Reliability

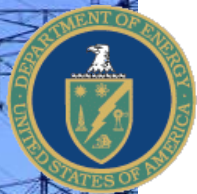
North American SynchroPhasor Initiative

DOE Update

Phil Overholt

Burlingame, California

October 12, 2011



SGIG Electric Transmission Systems Projects

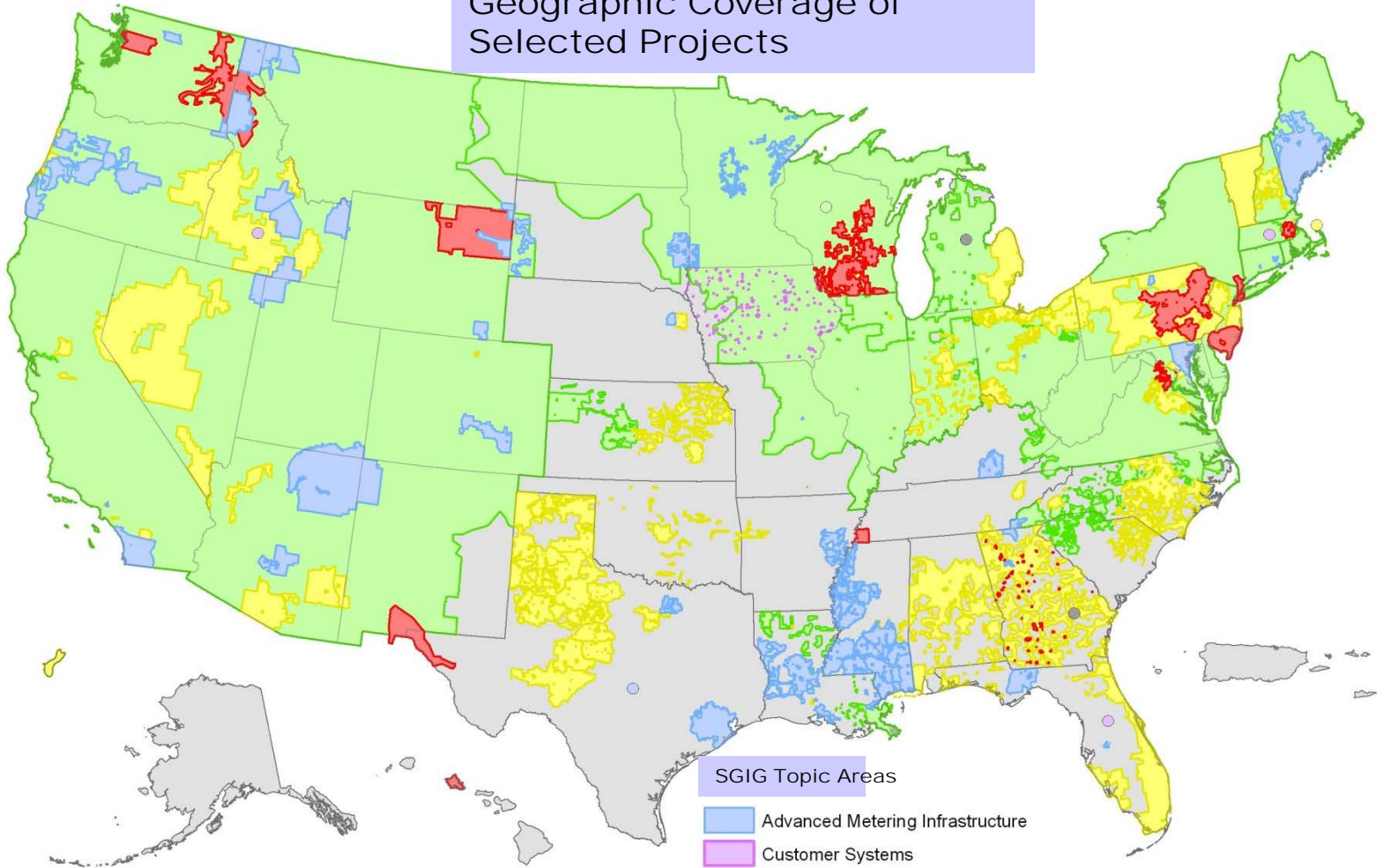
- American Transmission Company, LLC (PMU) \$2.7*
- American Transmission Company, LLC (SCADA) 22.9
- Duke Energy Carolinas, LLC 7.8
- Entergy Services, Inc. 9.2
- Midwest Energy, Inc 1.4
- Midwest ISO, Inc – 9 trans owner partners 34.5
- ISO New England, Inc – 7 18.1
- New York ISO, Inc - 8 75.7
- PJM Interconnection, LLC – 12 27.8
- Western Electricity Coordinating Council – 18 107.8

* Total Project Cost





Geographic Coverage of Selected Projects



SGIG Topic Areas

- Advanced Metering Infrastructure
- Customer Systems
- Electric Systems Distribution
- Electric Transmission Systems
- Equipment Manufacturing
- Integrated and/or Crosscutting Systems

100 Projects

Circle indicates project where specific utility/area is not known.

SMART GRID INVESTMENT GRANTS



SGIG Synchrophasor Projects Applications - a Sample

- Wide-Area Visualization and Monitoring
- Angle and Frequency Monitoring
- Inter-area Oscillation Detection & Analysis
- Proximity to Voltage Collapse
- State Estimation
- Dynamic Model Validation
- Fast Frequency Regulation





Advanced SynchroPhasor Research Projects

\$4.3 million awarded to four, 3-year projects

- **Regents of University of California**
 - Security-Dependability Adaptive Protection System
 - Alarms for Power Swing Encroachment on Relay Characteristics
 - Visualization
 - **Virginia Polytechnic Institute and State University**
 - Develop and Implement Synchrophasor-Based State Estimator
 - Develop Transducer Calibration Techniques
 - Characterize and Analyze Unbalanced Conditions
 - Develop Tools to Determine Optimum Islanding Strategies During Catastrophic System Events
 - Develop Visualization Tools for the 3-phase Tracking State Estimator
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Advanced SynchroPhasor Research Projects (con't)

- **Georgia Tech Research Corporation**

- Real-Time Implementation of the Distributed Dynamic State Estimation and Wide-Area Transient Stability Analysis
- Apply to On-Line Generator Parameter Identification to Generators in the NYPA System
- Implement Transient Stability Monitoring at other Plants/Substations

- **Electric Power Research Institute**

- Wide-area, Real-time Visualization of Frequency ,Voltage and Current Contours for Security Monitoring
- On-Line Identification of Major Events
- On-Line Event “Instant” Replay



NSF/DOE University of Tennessee/Knoxville Energy Research Center

- **University of Tennessee Knoxville - ERC**
Center for Ultra-wide-area Resilient Electric Energy
Transmission Network (CURENT)
 - Monitoring and Sensing
 - Communications and Cyber Security
 - Computation and Modeling
 - Control and Actuation
 - Economic Analysis



Contact Information

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Advanced SynchroPhasor Research Projects (con't)

- **Washington State University**

Power Grid Reliability and Security – Analysis and Simulation
for a Secure Communication Network from PMU to
Synchrophasor Applications

