# Smart Grid System Report Stakeholder Webinar Series

SGSR Information Networks Webinar

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# Real-Time System Operations Data Sharing

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# Real-Time System Operations Data Sharing Description

- Data and information that drive the applications which enable new and improved operational strategies to be deployed
- Sharing data in a timely fashion, approaching real-time, with all those with a need or right to know
- The metric focuses on sharing data between parties at the level of bulk transmission grid operations



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# Real-Time System Operations Data Sharing Proposed Metrics

- Current metrics
  - *(Metric 2.a) Total SCADA points shared per substation (ratio)*
  - *(Metric 2.b) Fraction of transmission-level synchrophasor measurement points shared multilaterally (%)*
- Other possible metric:
  - Number of ISO/RTO/utilities using dynamic scheduling (currently California ISO uses this functionality )



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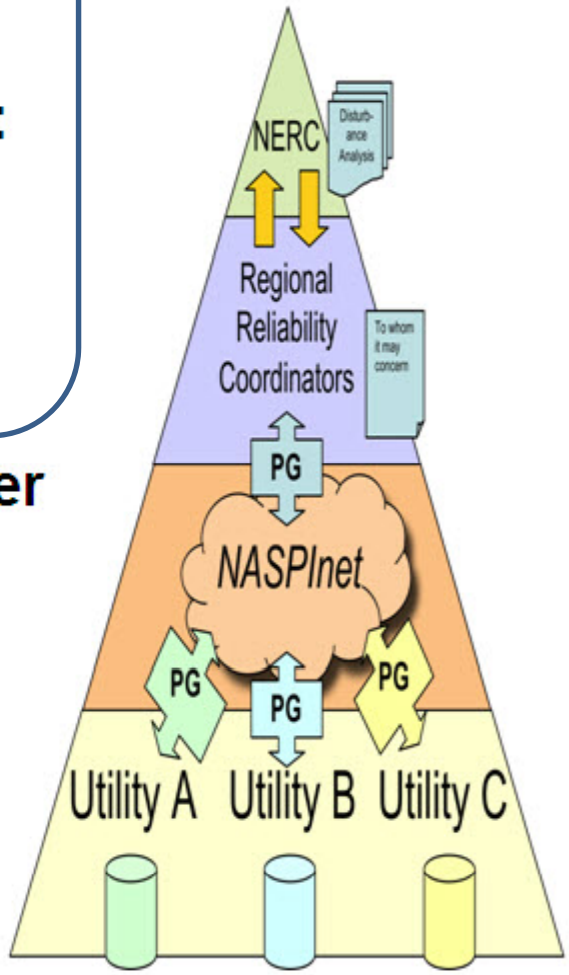
# Real-Time System Operations Data Sharing Proposed Metrics

- **A Wide Area Measurement System (WAMS) is crucial for the Grid**
- **One very promising data source for WAMS: Synchrophasors**
  - GPS clock synchronized; Fast data rate > 30 samples/sec
  - Phasor Measurement Unit (PMU)
- **Future applications will rely on large number of PMUs envisioned across Grid (>100k)**
- **WAMS Design and Deployment underway: North American Synchrophasor Initiative -** (www.naspi.org)
  - *Collaboration* - DOE, NERC, Utilities, Vendors, Consultants and Researchers
  - *NASPInet* – distributed, wide-area network



# Real-Time System Operations Data Sharing Proposed Metrics

- What metrics are most valuable in providing a sense of progress on the smart grid?
- Should we use North American SynchroPhasor Initiative (NASPI) data?
- Power Management Units (PMU) by ISO/RTO or Utility?
- Total PMUs?
- Other?



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# Real-Time System Operations Data Sharing Data Sources

- Previous report
  - NASPI information
- Next report
  - Potential other data sources? NASPI for PMU numbers, ISO using dynamic scheduling



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# Real-Time System Operations Data Sharing Stakeholders

- Transmission and Distribution Providers
- Balancing Authorities, Regional Coordinators & North American Electric Reliability Corporation (NERC)
- Local, State and Federal energy policymakers
- Product and Service Providers
- NASPI
- Aggregators of Generation and Demand
- Utilities and Customers



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# Real-Time System Operations Data Sharing Regional Aspects

- Each major interconnection area (Western and Eastern interconnects and ERCOT in Texas) have different rules, system characteristics, and technical issues

- NASPI is taking action to encourage participation in data sharing by all utilities using PMUs



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# Real-Time System Operations Data Sharing Challenges

- Business and Financial Challenges
  - Cyber security
  - Tradeoffs between operational, regulatory and business aspects
  - Stimulus funding has greatly reduced the cost barrier to implementation
- Technical Challenges
  - Distributed wide-area network design
  - Network management
  - Software development for limited market



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# Real-Time System Operations Data Sharing Stakeholder Metric Recommendations

- Is there another metric besides PMU numbers that would be useful?
- If so, what would it be and how could we find hard data?



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# Cyber Security

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# Cyber Security Description

- The North American grid is arguably the world's largest and most complex machine
- Under the right circumstances, problems occurring in one area have the potential to cascade out of control and affect large geographical regions
- Economic forces and technology development are making the power system more dependent on information systems and external communications networks
- Increased control capability, while vastly increasing the flexibility and functionality to achieve better economies, also introduces new cyber-vulnerabilities that have not previously existed



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# Cyber Security Metrics – Proposed Metrics

- Current metrics
  - *(Metric 18): the electric power industry's compliance with the North American Electric Reliability Corporation (NERC) Critical Infrastructure Protection (CIP) standards*
- Proposed Metrics
- What metrics are most valuable in providing a sense of progress on the smart grid?
- Do we need more than one? How many?



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# Cyber Security
# Data Sources

- Previous report
  - Previous report used interviews for data
- Next report
  - Better data sources? (NERC reporting of CIP definition process and future exception reporting)



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# Cyber Security Stakeholders

- End users
- Electric service retailers and wholesale electricity traders
- Distribution and transmission service providers, balancing authorities, and reliability coordinators
- Products and services suppliers
- Energy policymakers and advocates



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# Cyber Security
# Regional Aspects

- Approaches to address cyber security issues should not vary greatly internationally
- State specific issues may arise because of different laws relating to transparency of information associated with Freedom of Information Act issues
- There will also continue to be international and national standards in the cyber security area that may compete in technology and policy approaches



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# Cyber Security Challenges

- Business and Financial Challenges
  - There is an urgent need to quickly address these issues with the adoption of new versions of these standards, but the standards development and approval process is literally measured in years
  - Not all regulatory jurisdictions have recognized security as a recoverable cost, and other utilities are constrained in implementing security because it would cause preexisting rate cases to be reopened at great expense and risk to the company

- Technical Challenges
  - Electric system of the future could become much more vulnerable to disruption by skilled electronic intrusion originating either internally or externally
  - Cyber security is largely a defensive practice when applied to protecting against a steady flow of active exploits

# Open Architecture/Standards

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# Open Architecture/Standards Description

- Widespread adoption of openly available standards and architectural approaches is an indication of maturity in technology and business practices

- While direct measures of openness or standards adoption are difficult to obtain, one promising approach is to use concepts derived from the Carnegie Mellon Software Engineering Institute and the software capability maturity model (CMM)

- Rather than pick a “winner,” the Software Engineering Institute (SEI) at Carnegie Mellon took the approach of encouraging a culture of continuous process improvement. The result is the SEI Capability Maturity Model for Software (CMM), and subsequently, the CMM Integration (CMMI)

# Open Architecture/Standards Proposed Metrics

- Current metrics
  - *(Metric 19) Interoperability Maturity Level – the weighted average maturity level of interoperability realized among electricity system stakeholders*



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# Open Architecture/Standards Proposed Metrics

- What metrics are most valuable in providing a sense of progress on the smart grid?
- Do we need more than one? How many?



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# Open Architecture/Standards Data Sources

- Previous report
  - Previous report referenced the Smart Grid Maturity Model work at Carnegie Mellon and National Health Authority of Australia examples
- Next report
  - Better data sources?



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# Open Architecture/Standards Stakeholders

- Consumers
- Electric service retailers
- Distribution and transmission service providers
- Balancing authorities, generators, wholesale electricity traders, market operators, and reliability coordinators
- Products and services suppliers
- Regulators and policy makers



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# Open Architecture/Standards Regional Aspects

- Given the global reach of international solutions providers, open architecture and standards should be encouraged internationally
- National standards bodies will likely continue to have differences with their counterparts across the globe, in particular; USA, EU, Japan, China, and India
- Leading IT standards in use and being developed apply uniformly to all parts of a nation



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# Open Architecture/Standards Challenges

- Business and Financial Challenges
  - Flexibility is important in picking an architectural approach and associated standards
  - Return on investment is the classical mechanism to explore these trade-offs; however, it can be difficult to quantify the returns from moving toward solutions that manage risk and offer future alternatives
- Technical Challenges
  - Architectures and standards are subjects of innovation through better ideas
  - Features that focus on interfaces and that support extensions, versioning, and adaption to old and newer technologies can help support the need to evolve in the quickly changing world of technology



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