Smart Grid System Report Stakeholder Webinar Series

SGSR Information Networks Webinar

Three topics:

1. Real Time Operations Data Sharing
2. T&D Cyber Security
3. Open Architecture Standards

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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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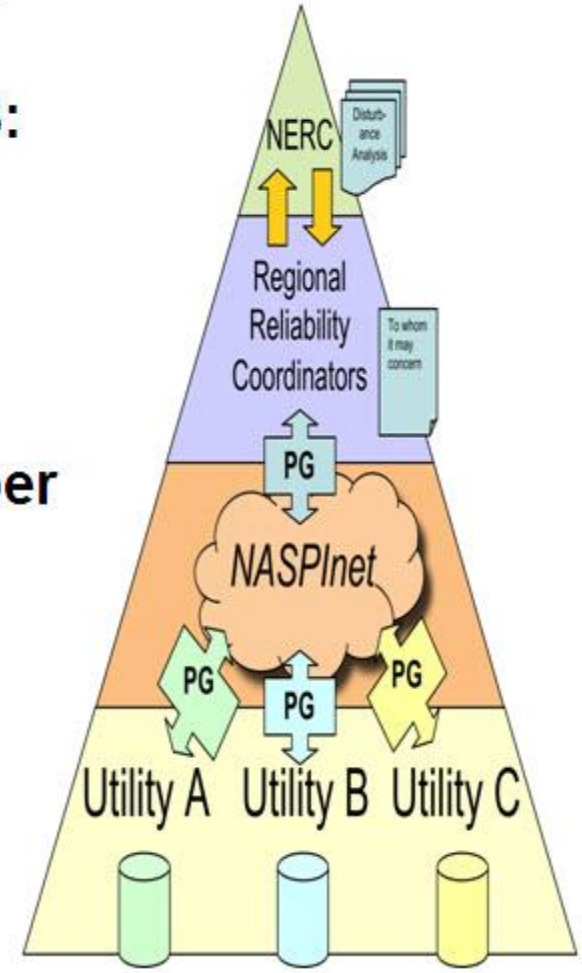
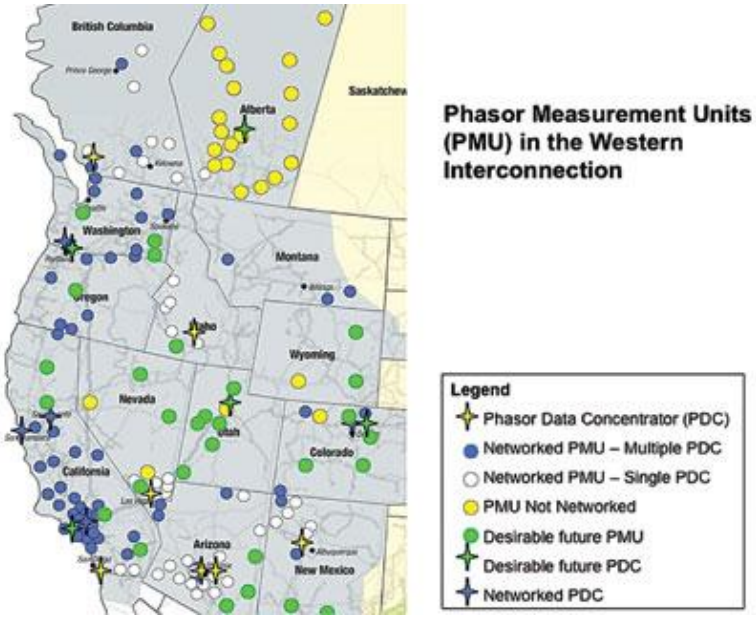
Real-Time System Operations Data Sharing Proposed Metrics

- **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 NASPI data?
- PMUs by ISO/RTO or Utility?
- Total PMUs?
- How should "sharing" data be defined, numbers or percentages?
- Other?



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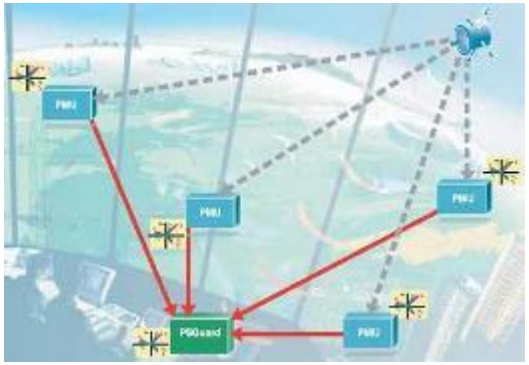
Real-Time System Operations Data Sharing Data Sources



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

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Real-Time System Operations Data Sharing Stakeholders

- Transmission and Distribution Providers
- Balancing Authorities, Regional Coordinators & NERC
- Local, State and Federal Energy Policymakers
- Product and Service Providers
- NASPI
- Aggregators of Generation and Demand Response
- Utilities and Customers

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?
- Because of the inability to find sources for shared data points, Metric 2a, should we drop this?
- If so, what would it be and how could we find hard data?

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Transmission and Distribution Cyber Security

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Transmission and Distribution Cyber Security Description

- Vulnerability of communications and control (Stuxne, Duqu examples)
- Potential to cause blackouts, change economics
- Cyber security measures targeted at
  - deterrence
  - defense
  - detection
  - response
  - recovery

- Smart-grid technologies increase system vulnerability
- T&D cyber security important as system automation grows

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Transmission and Distribution Cyber Security Proposed Metrics

- Current metrics
  - *North American Electric Reliability Corporation (NERC) Critical Infrastructure Protection (CIP) standards*
- *Currently active area in NIST, IEEE, IEC*

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Transmission and Distribution Cyber Security Proposed Metrics

- What metrics are most valuable in providing a sense of progress?
  - NERC CIP violations reporting
  - Other metrics

- How to identify data and gather it?

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Transmission and Distribution Cyber Security Data Sources

- This coming report
  - Data sources must be identified
    - IEEE Working Groups
    - IEC Working Group
    - NERC CIP violation reporting

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Transmission and Distribution Cyber Security Stakeholders

- End users
- Local, state and federal energy policymakers
- Regulators
- Utilities

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Transmission and Distribution Cyber Security Regional Aspects

- Global scale problem with breeches coming from around the world
- Cyber attacks and defense have become a military issue

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Transmission and Distribution Cyber Security Challenges

- Business and Financial Challenges
  - Stakeholders may be reluctant to spend money without seeing there is a problem!
  - There *must* be a way to recover costs
- Technical Challenges
  - Cyber security protection may lead to slower systems
  - Aging infrastructure is vulnerable
  - Will be an ongoing process

Open Architecture/Standards

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Open Architecture/Standards Description

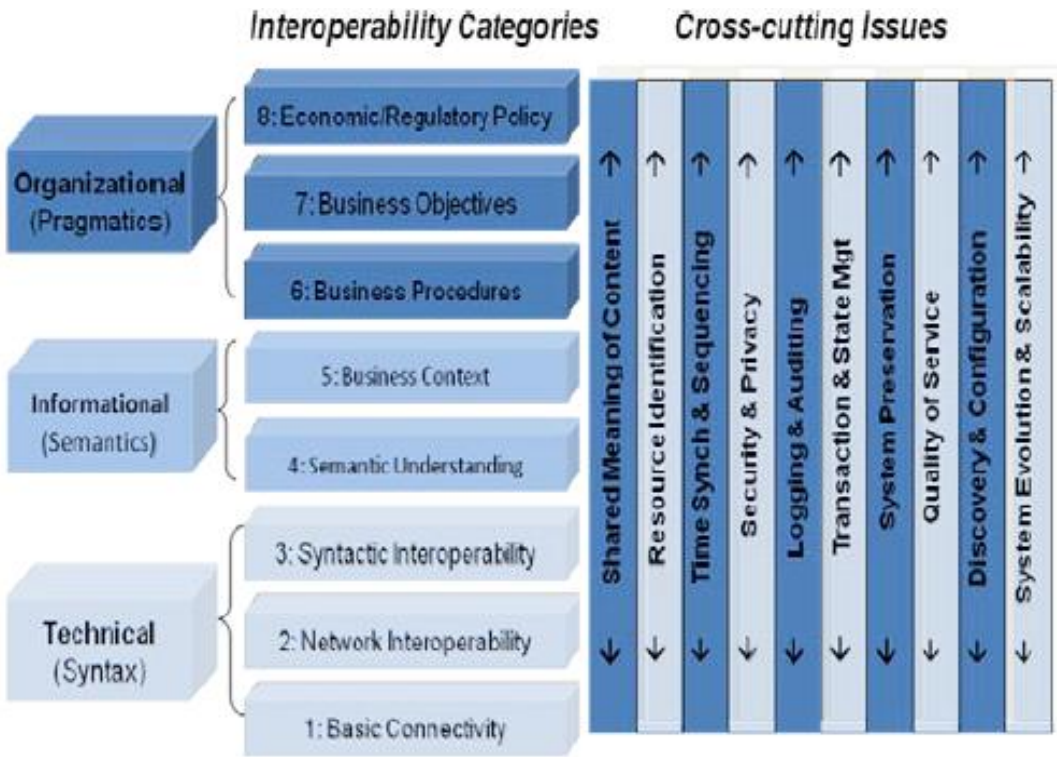
- Widespread adoption of openly available standards and architectural approaches is an indication of maturity in technology and business practices

- 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?
- Should we look at: NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 2.0, and track adoption of particular standards?
- Define the metric based on the # of areas where new standards introduced?

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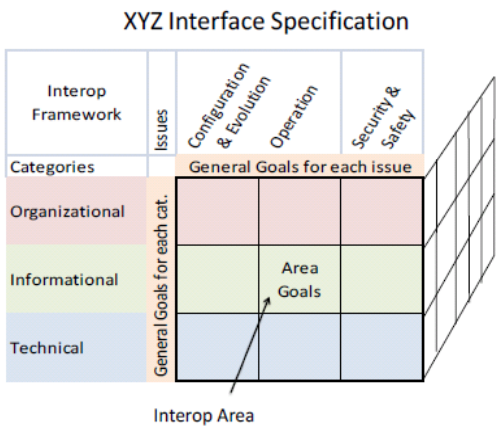
Open Architecture/Standards Data Sources

- Previous report
  - NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 1.0
- Next report
  - Better data sources?
  - NIST Framework and Roadmap for Smart Grid Interoperability Standards, Release 2.0



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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, state Public Utility Commissions may not agree with this outlook

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