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North American SynchroPhasor Initiative (NASPI) Overview

Data Exchange Panel
iPCGRID 2013 hosted by Pacific Gas & Electric

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NASPI Organization

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NERC NORTH AMERICAN ELECTRIC RELIABILITY CORPORATION

NASPI North American SynchroPhasor Initiative

Recovery Act Grants Have Accelerated Synchrophasor Deployment

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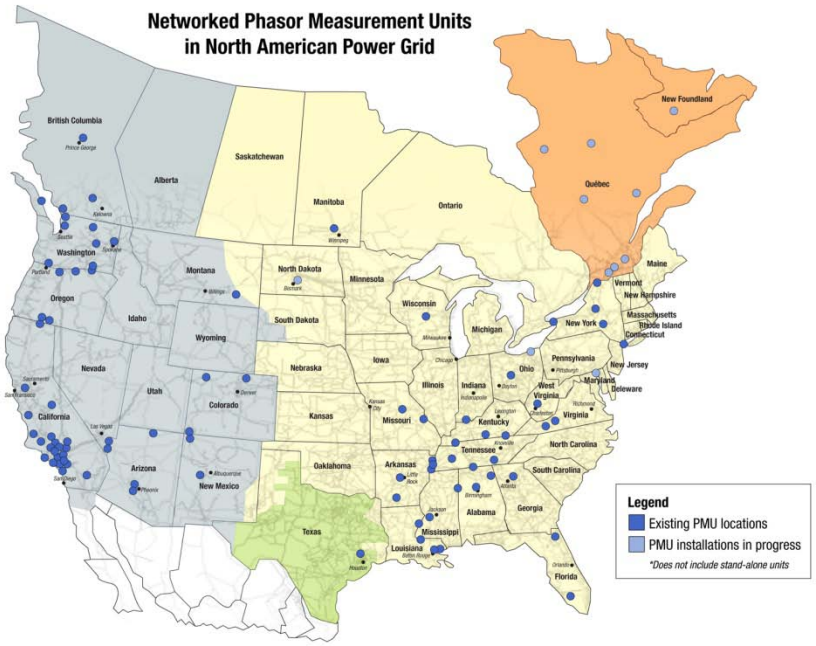
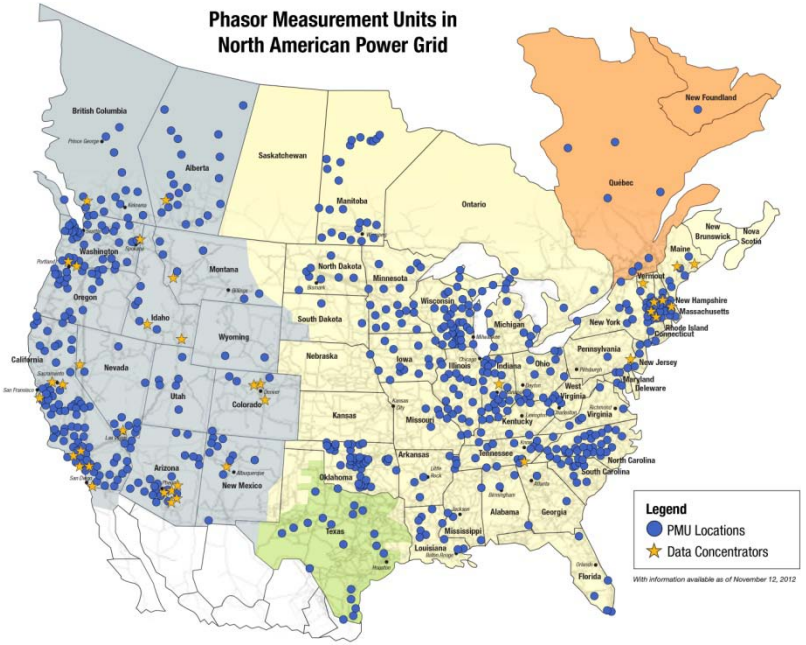
April 2007



November 2012



NASPI North American SynchroPhasor Initiative

ARRA Smart Grid Investment Grant Electric Transmission Systems Projects

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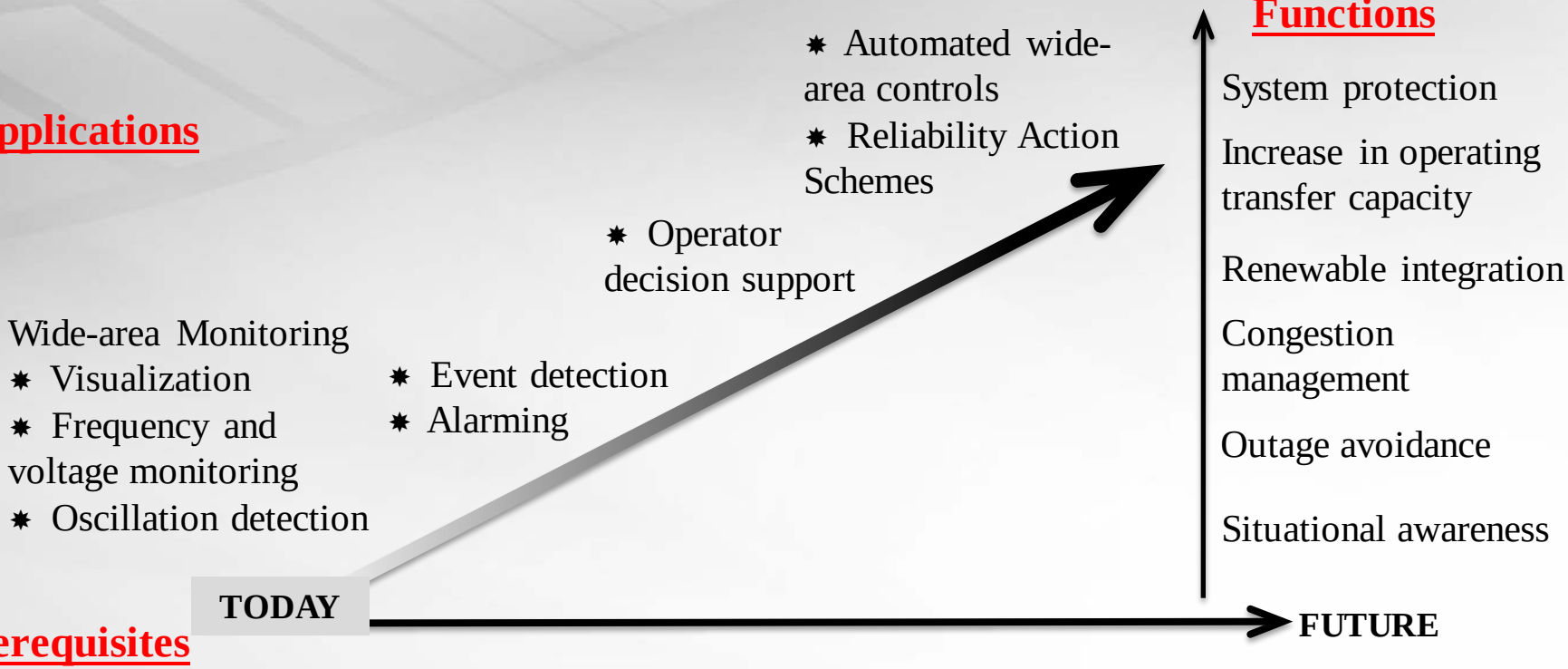
American Transmission Company, LLC (PMU)	$2.7*
American Transmission Company, LLC (SCADA)	22.9
Duke Energy Carolinas, LLC	7.8
Entergy Services, Inc.	9.2
Midwest Energy, Inc	1.4
Midwest ISO, Inc – 15 trans owner partners	34.5
ISO New England, Inc – 7	18.1
New York ISO, Inc - 8	75.7
PJM Interconnection, LLC – 12	27.8
Western Electricity Coordinating Council – 18	107.8

* Total Project Cost

Synchrophasor Value Proposition

- Real-time applications
  - Wide area visualization and situational awareness
  - State estimation
  - Voltage monitoring
  - Frequency monitoring and management
  - Oscillation detection and monitoring
  - Event detection
  - Alarming and limits
  - Stability monitoring (local and wide area)
  - Renewables integration
  - Congestion management
  - Automated controls
  - Islanding detection and restoration
- Off-line applications
  - Post-event analysis
  - Model validation
  - Baseline and pattern recognition

REAL-TIME SYNCHROPHASOR APPLICATIONS AND THEIR PREREQUISITES



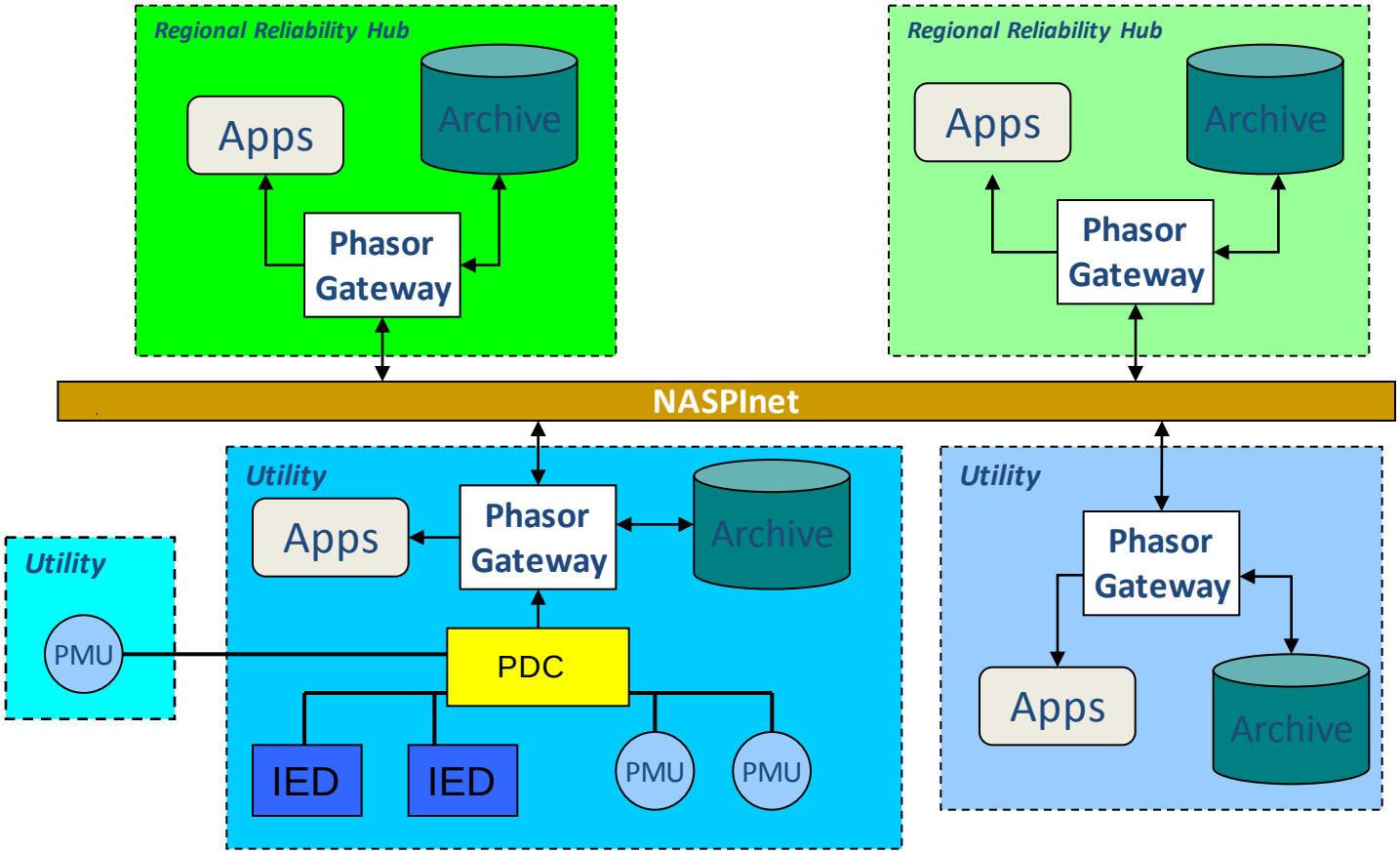
Prerequisites

ANALYSIS	Good data collection	Interconnection-wide baselining	Pattern detection	Model validation – system & elements	System studies
COMMUNICATIONS	Interoperability standards	High availability, high speed	Appropriate physical & cyber-security	Redundant, fault-tolerant	
USERS	Familiarity			Good visual interface	Training

Technology Maturation Process

- Sharing users' and vendors' success stories and high-value applications
- Accelerating development of technical interoperability standards
- Focusing and facilitating baselining and pattern recognition research (e.g., oscillation detection) and other R&D
- Early identification of project implementation challenges and community work to develop and share solutions
  - Develop and test PMU device specifications and interoperability
  - Communications network design
  - PMU placement
  - End-to-end data flow and quality
  - Developing requirements for "production-grade" systems
  - Building key software infrastructure
  - Enhance applications value and operator and user training
  - On the horizon – more technical standards; cyber-security and GPS

The NASPInet Vision
A Distributed Network for Data Exchange and Sharing



Security of Synchrophasors

- Synchrophasors are becoming part of the bulk electric system and will require physical and cyber security
  - ***But these systems shouldn't be treated any differently than other forms of measurement and control telemetry***
- Synchrophasor systems will coexist with other bulk electricity system (BES) cyber infrastructure and will have similar dependencies on common communications and network elements
- System designers and owners are leveraging emerging cyber-security standards and technologies
- Currently available phasor applications require further data analysis, software refinement and operational validation to be fully effective; many are in advanced development and testing and are not in full operational use
  - Therefore, many of these systems are not currently considered critical cyber assets
- Due to nature of continuous, high-volume data flows, new technology will likely be required for measurement, communications, and applications
  - Technology anticipated to undergo rapid change and refinement over the next several years that is being addressed by ongoing research programs

Technology Deployment Challenges

- Application maturity
  - Critical for operator acceptance, and maintaining support across the organizational enterprise
- Established knowledge base (training and adoption issues)
- Interoperability
- Cyber security
- Reliability/robustness of the measurement technology and supporting infrastructure
- Data sharing challenges
- Governance issues associated with shared data networks
- Data quality (including networks)
- Evolving data exchange and measurement technology standards
- Demonstrating the value proposition (including regulatory acceptance of the technology)
- Continued industry leadership and support to achieve interconnection-wide systems

Conclusions

- DOE has played a key catalyst role in the development and implementation of synchrophasor technology
- DOE and NERC will continue to support industry efforts to promote and enable widespread adoption of advanced monitoring technologies to ensure grid reliability
- DOE will actively support needed R&D to ensure that the full value of a North American phasor network will be realized
  - ***Hardware*** – measurement technologies
  - ***Network*** – data access and security
  - ***Software Applications*** – focus on reliability management objectives
  - ***Demonstrations*** – regional in scope
- Recovery Act is enabling unprecedented advancement of synchrophasor technology deployment

http://www.naspi.org/