What's next for synchrophasor technology?
CIGRE GOTF Tutorial

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Overview

- Value from synchrophasor technology
- What's ahead in applications and uses
- What's ahead for device buyers

Value from synchrophasor technology (1)

- Better asset utilization and more throughput from existing grid assets without additional capital expenditures through synchrophasor-powered
  - Dynamic line loading
  - Automated SPS/RAS schemes
  - Automated equipment operations
- Better operational security through early detection of grid problems from synchrophasor-based
  - WAMS and shared understanding across all control rooms
  - Alarms and alerts for voltage stability and oscillation detection, line loading, phase angle walk-outs
  - Central and distributed state estimation
  - Operational diagnostics of equipment mis-operations
  - PMU data as redundant back-up for SCADA/EMS system

Value from synchrophasor technology (2)

- Better renewables integration and use
  - Voltage and oscillation detection and management
  - Better ancillary services for renewables integration
  - Better data for intermittent resource models and output forecasting
- Better resource and grid planning using PMU data for better dynamic and steady-state models
  - Generator and equipment model validation and calibration
  - Dynamic and steady-state system model validation

Value from synchrophasor technology (3)

- Reduce costs of TO, GO and RC activities
  - With better models, better dispatch of resources and ancillary services (thus operational $ savings)
  - More frequent and accurate model validation w/o asset shut-down and physical testing (capital $ savings)
  - More accurate, faster forensic event investigation (labor $ savings)
  - Equipment and O&M savings from better field equipment diagnostics and management

What's ahead in applications and uses (1)

- Automated detection of a variety of grid events and equipment problems, from voltage stability and oscillation detection to remote equipment condition diagnostics, based on continuing work in data mining, baselining, pattern recognition and grid analytics
- Interconnection-wide shared data all the time and wide-area visualization screens in emergency situations
- State estimation supplemented by synchrophasor-based state assessment, both central and distributed (substation, sub-TO)

What's ahead in applications and uses (2)

- Automated, closed-loop control schemes for grid protection
- NERC standards that incorporate synchrophasor technology and data quality capabilities
- New and evolving uses
  - Load monitoring and FIDVR detection
  - Verify customer demand response performance
  - Microgrid management
  - GMD-GIC impact assessment
  - Control room displays that incorporate synchrophasor data and gaming visualization techniques for better operator insight and usability
  - Better operator and engineer training using synchrophasor-recorded events and simulations

What's ahead for system and equipment buyers

- Evolving communications network designs and capabilities to leverage IT insights and security needs
- Commercial-grade PMUs built to advanced technical interoperability standards with conformance testing and certification
- More capabilities moving from hardware to software, yielding multi-function devices with better remote upgrade capabilities.
- PMUs with time source redundancy
- Micro-PMUs for use at distribution and micro-grid level

Learn more

- See resources at www.naspi.org
- Join us – North American SynchroPhasor Initiative, a voluntary international collaborative of industry, academics, government and consultants doing information-sharing and joint problem-solving to advance the value and use of synchrophasor technology.

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NASPI North American SynchroPhasor Initiative