Pacific Northwest
NATIONAL LABORATORY

The North American SynchroPhasor Initiative (NASPI): Status and Path Forward

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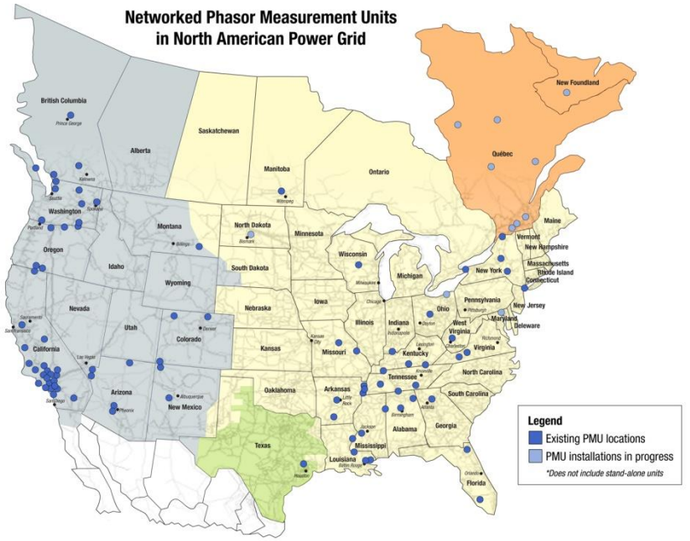
The North American SynchroPhasor Initiative (NASPI)

The U.S. Department of Energy (DOE) and EPRI are working together closely with industry to enable wide-area time-synchronized measurements that will enhance the reliability of the electric power grid through improved situational awareness and other applications.

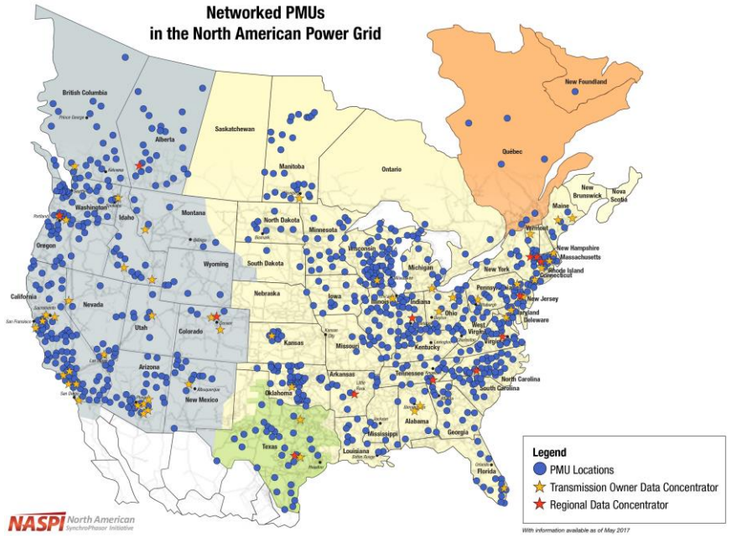
Current and emerging areas of emphasis/focus for NASPI:

- Networking and communications technologies (advanced architectures)
- Statistical analysis and deep learning for extracting actionable information from large datasets
- High-speed “point-on-wave” measurements to characterize the transient behavior of inverter-based resources and other fast-acting phenomena

April 2007



May 2017



“Better information supports better - and faster - decisions.”

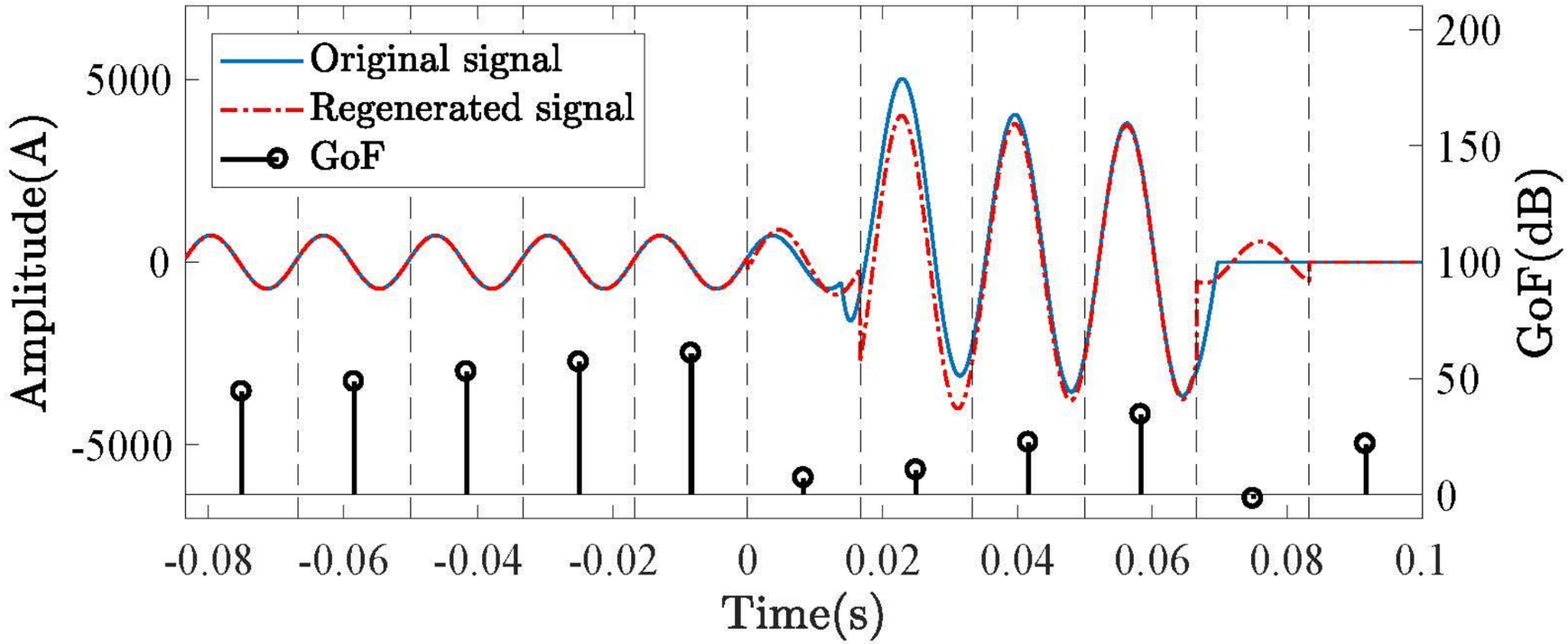
NASPI Current Status

- Technical Task Teams (comprised of, and led by, key industry stakeholders)
  - Control Room Solutions
  - Data & Network Management
  - Distribution
  - Engineering Analysis
  - Performance Requirements, Standards & Verification
- Work Group Meetings (twice per year, typical attendance = 200)
  - Most recent: April 2019 San Diego, CA
    - ✓ Networking and communications technical workshop
    - ✓ Statistical analysis and deep learning
    - ✓ Point-on-wave measurements
  - Upcoming: October 2019 Richmond, VA
    April 2020 Minneapolis, MN

Path Forward

- Continue to support and liaison with “mainstream” synchrophasor activities
  - IEEE, NERC, WECC, etc.
- No substantial structural changes envisioned to the structure of the NASPI leadership team, task teams, or meeting tempo
  - We will strive to maintain approximately equal representation among utilities, vendors, and academia, a unique attribute and key value proposition for NASPI
- Current and emerging areas of emphasis/focus for NASPI:
  - Networking and communications technologies (advanced architectures)
  - Statistical analysis and deep learning for extracting actionable information from large datasets
  - High-speed “point-on-wave” measurements to characterize the transient behavior of inverter-based resources and other fast-acting phenomena
- DOE is considering leveraging NASPI for additional programmatic linkages including sensors and protection

The “Goodness of Fit Concept” – A nascent approach under development for understanding when point-on-wave measurements should augment traditional synchrophasors



Goodness of Fit can be low for various reasons:

- Noise in the measured signal, especially at low currents (low Signal to Noise Ratio)
- Distorted waveforms, particularly during the first or last cycle of faults
- DC offsets (decaying DC) during the early cycles of faults with long time constants
- Distortions due to instrument transformer saturation
- Distorted waveforms during high-impedance faults

Conclusions

- Precise timing is widely used to support synchrophasor applications in the electric power sector
- Synchrophasors have long been used for important applications, such as validating power system dynamic models
- There are emerging applications being deployed that utilize synchrophasors for operational applications
- Various research initiatives are underway that will continue to introduce advanced technology to solve planning and operational challenges
- There is an emerging need to support additional high-speed "*point on wave*" measurements to characterize the behavior of inverter-based resources during off-normal conditions

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https://www.naspi.org/

Thank you