Pacific Northwest
NATIONAL LABORATORY

When GPS Fails, What Keeps the Grid in Sync?

HOW THE POWER GRID CAN MAINTAIN RELIABLE OPERATIONS WHEN GPS ISN'T AVAILABLE

The U.S. power grid's dependence on GPS for time synchronization introduces a critical vulnerability. A lost or spoofed signal can disrupt synchronized operations, trigger false alarms, or degrade protection systems. That's why Pacific Northwest National Laboratory (PNNL), supported by the Department of Energy's Grid Deployment Office, is leading a technical assistance initiative to help utilities test and deploy alternate GPS timing solutions.

WHY PRECISE TIME SIGNALS MATTER

Modern electric grid operations rely on precise time signals—often down to the microsecond or less—to function safely and efficiently. Devices and systems across the grid, like phasor measurement units (PMUs), supervisory control and data acquisition (SCADA), fault detection and recovery tools, and black start coordination protocols, rely on accurate, precise, and synchronized timing to work together. Without it, data can become misaligned, reducing visibility and slowing response during grid events.

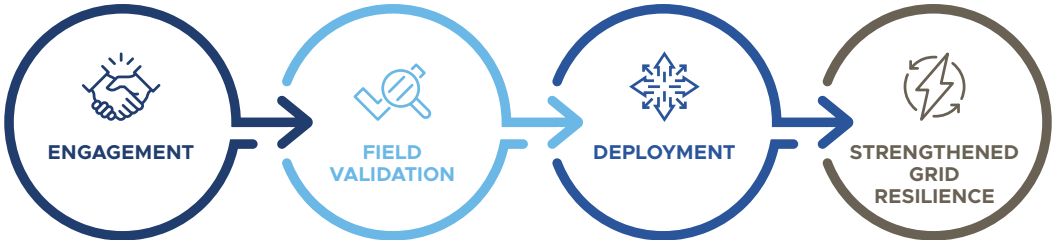
RISKS OF SINGLE-SOURCE TIMING

Grid operations often depend on a single timing source: GPS. While GPS delivers accurate, precise, and synchronized time, it's vulnerable to:

- Jamming
- Spoofing
- Natural interference
- Cyber or physical disruption

Even brief GPS interruptions can disrupt critical functions and delay grid recovery.

PATH TO TIMING RESILIENCE



THE CASE FOR TIMING RESILIENCE

As the grid becomes more dynamic and distributed, reliable time synchronization is essential. GPS will likely remain part of the solution, but building in redundancy and diversity strengthens grid resilience.

EVALUATING GPS-INDEPENDENT TIMING SOLUTIONS

PNNL is leading a national effort to evaluate and demonstrate GPS-independent timing solutions. Key activities in this initiative include:

- On-going assessment of applicability of GPS alternative solutions
- Supporting deployments at utility sites
- Informing scalable, secure precision timing architectures
- Providing guidance for national grid timing strategies
- Identifying and reducing timing vulnerabilities

PILOT PARTICIPATION OPPORTUNITY

PNNL is seeking utility and grid operator participants that are prepared to make a capital investment in their timing infrastructure.

Selected participants will:

- Commit technical resources
- Potentially receive no-cost precision timing solution equipment
- Strengthen timing infrastructure while contributing to our national grid resilience
- Share feedback to guide best practices and future standards

This is a collaborative, non-commercial opportunity to contribute to grid resilience.

IDEAL UTILITY AND GRID PARTNERS

- Power marketing administrations
- Investor-owned utilities
- Rural electric cooperatives
- Municipal utility operators
- Independent system operators

MORE INFORMATION, CONTACT:

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