

## Siemens introduces breakthrough time synchronization to fortify digital substations

- **New Siemens Siprotec 5 PTP Grandmaster Clocks (GMC) keep protection functions running without interruption – even during clock switchovers**
- **Patent-pending technology eliminates costly downtime risks for critical grid infrastructure**
- **Enhanced cybersecurity through strict separation of process bus and station bus networks**

Siemens has unveiled its latest innovation for energy infrastructure: the Siprotec 5 Precision Time Protocol (PTP) Grandmaster Clocks (GMC). Built to secure the backbone of modern power grids, this solution ensures resilient, fail-safe time synchronization for digital substations, safeguarding critical protection functions from disruption, shielding against external disturbances, and strengthening cybersecurity to boost overall grid reliability.

In today's digital power grid, precise time synchronization is essential for protection systems. While many applications require globally accurate time signals, sampled values within process bus systems primarily depend on consistent local precision rather than external global sources.

Siemens' solution separates sample synchronization from global time synchronization using specialized internal time sources. The Siprotec 5 devices, equipped with integrated PTP Grandmaster Clocks compliant with IEEE 1588v2/PTP standard, operate independently from external Global Navigation Satellite System (GNSS) signals. Instead, they use internal oscillators as time references for precise synchronization.

A key feature of this approach is Siemens' patent-pending *Seamless PTP grandmaster changeover* technology, built into Siprotec 5 devices. This ensures that when primary clocks return, they first align with active backup clocks before resuming their role. In doing so, disruptive time base jumps during switchovers are prevented, keeping protection functions continuously available.

The specialized synchronization enables process bus networks in digital switchgears to operate autonomously without external access points, significantly strengthening cybersecurity by isolating the process bus from the station bus network.

Conventional digital substation architectures often rely on redundant GNSS-based grandmaster clocks. However, even with redundancy, they remain vulnerable: disturbances to GNSS signals, whether from natural phenomena like solar storms or intentional interference such as jamming and spoofing, can cause disruptive 'jumps' in the time base. Such disruptions force merging units to resynchronize, temporarily disabling critical protection functions and can lead to unnecessary removal of equipment from service or even cause false tripping events, impacting grid stability and increasing operational costs. Siemens' new solution mitigates these risks, ensuring uninterrupted, secure operation.

"This technology directly addresses one of the most critical vulnerabilities in digital substations," said Onyeche Tifase, Vice President Product Lifecycle Management at Siemens Smart Infrastructure. "By keeping protection functions active through any time source change and shielding process networks from external threats, we are helping customers operate safer, more reliable, and more sustainable power systems."

This press release as well as a press picture are available here

<https://sie.ag/5BFRdT>

For more information on Siemens Smart Infrastructure, please see

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**Contact for journalists:**

Siemens Smart Infrastructure

Nicole Bär

Phone: +41 79 450 50 31; E-Mail: [nicole.baer@siemens.com](mailto:nicole.baer@siemens.com)

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In fiscal 2025, which ended on September 30, 2025, the Siemens Group generated revenue of €78.9 billion and net income of €10.4 billion. As of September 30, 2025, the company employed around 318,000 people worldwide on the basis of continuing operations. Further information is available on the Internet at [www.siemens.com](https://www.siemens.com).