

A photograph of an electrical substation with a large clock overlay in the foreground. The clock is semi-transparent and shows numbers from 7 to 10. The substation equipment is blue and white, with two workers in blue uniforms and hard hats visible in the background. The overall scene is set against a bright, slightly hazy sky.

High-Precision Time Synchronization for Power Plants and Substations

- SyncE Switching Solution for Reliable Smart Grid Networks

At a Glance

As smart grids and IEC 61850 substation automation systems continue to evolve, precise time synchronization has become a fundamental requirement for reliable power system operations. From protection relays to SCADA monitoring systems, every device within the network must operate with accurate and consistent timing. However, when time synchronization becomes inaccurate, protection relays may misinterpret network events or delay fault isolation. This slight timing deviation can eventually lead to equipment damage, system instability, or large-scale power outages in mission-critical power infrastructure.

Accurate timestamps are also essential for event logging and fault analysis. Without precise time alignment across the network, operators may struggle to reconstruct the sequence of events during incidents, making troubleshooting slower. For power plants and substations, deploying a high-precision time synchronization network is therefore critical to ensuring grid stability, operational safety, and reliable power delivery.

Industry Challenges

With the rapid advancement of smart grids and IEC 61850 automation, power plants and substations must address multiple challenges, such as:

- **Reliable Protection System Operation:** Protection relays and many other networked devices rely on precise timing to instantly detect and isolate faults. Without proper synchronization, devices may perform incorrect operations or delay protective responses, increasing the risk of equipment damage and grid instability.
- **Accurate Event Recording:** Inconsistent timestamps can lead to incorrect SOE (Sequence of Events) records, making fault analysis more complicated and increasing operational risks.
- **Long-Distance Communication:** Power networks often span large geographic areas with distributed field devices. This requires stable, high-bandwidth, and low-latency connectivity to ensure real-time data transmission.
- **Harsh Industrial Environments:** Substations and power plants operate in environments with extreme temperatures, strong electromagnetic interference, and demanding industrial conditions that exceed the capabilities of standard commercial networking equipment.

Without a reliable synchronization infrastructure, power systems may face increased risks of incorrect operation, cascading faults, and large-scale outages.

CTC Union SyncE Switching Solution

To address the challenges mentioned above, CTCU introduces the IGS-1608SM-SE(-8PH) industrial SyncE switch. It not only enables the deployment of highly reliable, low-risk communication networks in power plants, but also enhances the resilience of smart grids to ensure long-term stable and secure operation of critical infrastructure. Its key features and advantages include:

Precise Time Synchronization

- Supports SyncE and IEEE 1588v2 PTP
- Provides microsecond-level time and frequency synchronization
- Ensures the accurate operation of protection systems, Process Bus, PMU, and SCADA

High-Performance Connectivity

- 16 Gigabit RJ45 ports and 8 GbE/Fast SFP fiber ports
- Supports high-bandwidth, long-distance, and low-latency communication
- Ideal for point-to-point interconnection of critical devices

Industrial-Grade Reliability

- Rugged design with optional DIN-rail and wall-mount installation
- Standard operating temperature: -10°C to 60°C; wide-temperature models support -40°C to 75°C
- Suitable for power plants, substations, and other harsh industrial environments

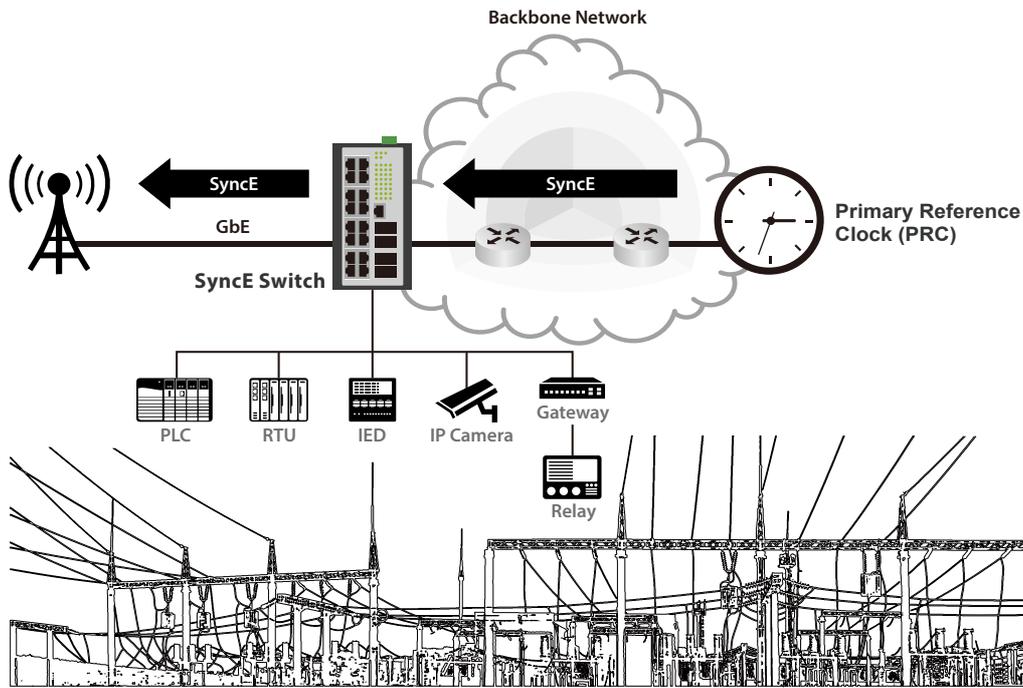
Powerful PoE+ Capability

- Complies with IEEE 802.3at PoE+ standard, delivering up to 30W per port
- Enables Ethernet cables to simultaneously transmit power and microsecond-level synchronized data, supporting devices such as PTZ cameras, wireless APs, VoIP phones, and infrared sensors
- PoE scheduling and remote auto-reboot (PoE Device Auto-Check) reduce the need for maintenance visits to remote sites

Risk Reduction and Enhanced Smart Grid Resilience

- Precise synchronization significantly reduces the risk of protection system malfunctions
- Supports operation in environments without GPS or when GPS signals are unavailable
- Ensures the long-term stability and security of critical infrastructure operations

Application



Building a More Resilient Smart Grid

The IGS-1608SM-SE-8PH Industrial SyncE Switch provides utilities with a powerful platform for building high-precision time synchronization networks in power plants and substations.

By combining microsecond-level synchronization, high-performance connectivity, and industrial-grade reliability, the solution ensures that critical power systems operate safely, efficiently, and reliably under demanding conditions.

Related Products



Industrial GbE Switch with SyncE
IGS-1608SM-SE-8PH



Industrial GbE Switch with SyncE
IGS-1608SM-SE



Industrial GbE Switch with SyncE
IGS-804SM-SE

• The specification and pictures are subject to change without notice.



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