Cisco Connected Grid Solutions for the Substation

Achieving Grid Reliability and Compliance with the Network

Identified as critical national infrastructure by most nations, today’s utilities are under pressure to assure 24 hours a day, seven days a week reliability and availability of the power grid. Increasingly, they are faced with demands for more regulatory compliance, better security, renewable resource integration, and transparency of grid operations. To meet these needs, utilities are turning to smart grid technologies enabled by a communications network for the substation. This network architecture gives engineers the situational awareness they need to control and monitor even the most remote grid assets and systems.

Designed for highly secure, reliable, and scalable utility infrastructures, Cisco Connected Grid solutions can enable intelligent deployments to support:

- Grid reliability across large distributed territories
- Regulatory compliance to meet evolving government standards such as NERC CIP
- Reduction of operational expenses by improving efficiency and monitoring at each location
- Workforce and public safety, as well as physical security for remote sites

The Challenges of Traditional Substation Design

Traditionally, transmission and distribution substations have been designed to support a centralized energy delivery grid. Analog and leased communication lines are run into the substation for dedicated applications, with additional lines overlaid as needed. However, this approach lacks the functionality and scalability needed to meet today’s standards and security requirements. Substation operators face challenges such as:

- Managing existing legacy infrastructure while complying with new security mandates and industry standards
- Proliferation of leased line circuits and siloed applications which lack interoperability
- Existing hardwired connections that require complex reconfiguration and testing
- A centrally controlled network that lacks the visibility and distributed control needed for grid automation

- Low bit rate throughput that does not support converged applications such as security and workforce management
- Harsh, physically demanding environments where sophisticated computing equipment is not normally installed

The Cisco Connected Grid Solution

A Cisco Connected Grid wide area network (WAN) can enable a communication network that connects the substation to headquarters and the data center. This can provide a series of automated services that allow managers to monitor intelligent electronic device (IED) status, gather sensor readings, manage station assets, provision software, and provide centralized physical security monitoring. This powerful networking capability, based upon the Cisco GridBlocks™ architecture, is built using products specifically designed for the substation environment (see Figure 1).

Figure 1. Cisco Products Designed for the Substation Environment

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The Cisco 2500 Series Connected Grid Switches is a family of ruggedized switches designed for the intelligent energy infrastructure. They feature:

- A rugged industrial design and substation compliance: IEC-61850-3 and IEEE 1613 for utility substation environments
- Tools for easy deployment, management, and replacement
- Extensive instrumentation and remote diagnostic capabilities
- Advanced quality of service capabilities to support mission-critical substation applications such as Supervisory Control and Data Acquisition (SCADA) and IEC 61850 GOOSE messaging
- Comprehensive network security features based on open standards

The Cisco 2000 Series Connected Grid Routers are also ruggedized for the smart grid. They:

- Are IEC-61850-3 and IEEE 1613 compliant for the substation
- Provide a modular interface and power supplies, and offer increased bandwidth, a diversity of connection options, and network resilience
- Contain Cisco IOS® Software features that offer advanced integrated services, including advanced data routing and transport, firewall, traffic shaping, quality of service, and network segmentation
- Provide tools for easy deployment, management, and replacement
- Include multiple interface and module options such as Serial, T1/E1, DSL, 2G/3G/4G LTE Cellular, and Ethernet Switch Modules

To help manage network traffic, Cisco Connected Grid ruggedized solutions also include the Cisco 1- or 2-port channelized T1/E1 and ISDN PRI Grid Router WAN Interface Card (GRWIC) and the Cisco 8-port A/S Serial GRWIC.

Benefits of the Substation Automation Products

- Dedicated and reliable communications based on interoperable devices on a common network
- Remote monitoring of station equipment and sensors for better transparency
- Improved load and consumption balancing based on more accurate information
- Reduced service disruption due to more timely equipment maintenance
- Lower operational costs, reduced multiple lease line charges, and improved productivity
- Better demonstrated regulatory compliance
- Improved incident response, better worker safety, and stronger loss prevention

Cisco Advanced Services

Cisco Services has architected some of the world's largest industrial networks, and is available to advise and guide utilities as they implement communications network initiatives in the substation. Working closely with in-house operations and IT, the Cisco team assesses existing systems, creates the communications framework, and plans and designs a network architecture for maximum grid communications efficiency. They also undertake a detailed analysis of use cases for current and future environments, customizing each service to specific needs for generation, transmission, and distribution.

Why Cisco?

Cisco brings more than 25 years of industrial networking experience, leading major technology trends in security, reliability, and efficiency for the energy industry. Automating substations with the network can enable utilities to manage, control, and automate remote grid assets more efficiently, combining business and utility functions, and simplifying grid operations well into the future.

For More Information

For more information on Cisco Connected Grid products please visit http://wwwin.cisco.com/etg/smartgrid/products/