



U.S. Multistate Electric Utility Delivers Renewable Energy Generation with Cisco

Innovative energy company achieves secure, resilient, and scalable connectivity for more than 2000 wind turbines distributed over 150 sites.



Customer summary

Customer name:
Electric Utility Company

Industry:
Energy

Location:
USA

Challenges

Over the past 20-plus years, renewable power generation has increased in terms of megawatt output and the physical number of sites involved in next-generation utility services and sources across the energy sector. Remote wind farms account for a 25 percent year-over-year growth in generation. Wind-based sources are incrementally more viable as turbines become less expensive to manufacture and deploy. This renewable energy opportunity introduces new endpoints, systems, and critical infrastructure to the utility's ecosystem and network. And the addition of this geographically distributed equipment presents new complexities for operational control – simultaneously increasing connectivity requirements and security imperatives.

Cisco® helps utilities take on this opportunity with confidence that the organization can efficiently and securely deploy and integrate greener and renewable energy sources with existing sources and systems. Managing and monitoring remote wind turbines can be challenging, and with Cisco the utility can provide essential predictability, reliability, and efficiency of energy generation.

This large multistate U.S. utility company faced the universal challenges that are common across wind farm initiatives, whether on land or offshore. The wind-power infrastructure and turbines are typically located across wide expanses of remote, rural areas, often several hours away from utility corporate offices and at a distance from the field workforce and service hubs.

The utility requires:

- An always-on understanding and clear view of the current state of the distributed turbine operations
- Granular visibility to environment and equipment status in real time
- The ability to predict when maintenance should occur across wind farms and to respond to incidents promptly

The utility is accountable for generation, safety, and environmental excellence across hundreds of wind farms simultaneously. Management and monitoring must occur from a consolidated and central network operations center with efficient and complete visibility to details about the turbines at many sites. This capability is essential to achieve the remote and automated control required for today's operations. The overall goal is to maximize energy output. And the utility is proactively building a flexible and intelligent network that addresses its requirements today with a clear path forward to evolve for the future.

The utility needs to

- Collect real-time operational information from its wind farm turbines
- Provide physical security (access control and video surveillance) across multiple remote sites
- Support scalable and resilient operations with a network that is highly robust and flexible for growth

Solution

The Cisco multi-service network foundation:

- Reduces expense in time to operations when deploying new wind farm sites
- Achieves ongoing operational cost savings
- Delivers stronger cybersecurity and physical security
- Enables visibility and control for efficient operations

The U.S. Energy Information Administration (EIA) expects wind power to surpass hydroelectricity, based on forecasts in the [Short-Term Energy Outlook](#).



Products involved in this solution



Cisco industrial routers

(CGR 2010 or IR 809)

- Ruggedized form factor supporting IEC 61850-3/IEEE 1613 standards
- Rack mount or din rail installation options
- Advanced cybersecurity features, including IPSec using DMVPN, GETVPN, and FlexVPN
- Ability to transport legacy serial protocols
- Flexible WAN connectivity options: T1/E1, Ethernet (public and private), or cellular



Substation security

Cisco Industrial Security Appliance (ISA 3000)

- Ruggedized form factor supporting IEC 61850-3/IEEE 1613 standards
- Next-generation firewall and IPS with deep packet inspection of industrial protocols
- Hardware bypass for improved reliability under failure scenarios
- Integration with Cisco Firepower® Management Center

Results

Next-generation critical infrastructure for energy innovation

A single wind farm is just one among many connected sites owned and operated by this utility. Each farm has several hundred individual turbines, which perform like large robots – adapting and responding to changing environmental dynamics, conditions, and variables captured by sensors and local instrumentation. With Cisco, the utility has successfully deployed an integrated and secure solution to gain the detailed visibility it needs to manage remotely, including:

- Critical operational data for each turbine plus instantaneous system status and power generation
- Physical access control using badge access readers
- Tamper and door/hatch alarms and sensor-based control
- Video surveillance to monitor the subcomponent operations and physical security of the site
- Voice communications in each turbine, including IP telephony
- Resilient connectivity in the event of fiber link or network device failures
- End-to-end encryption of operational traffic – across the network and between the substation and wind turbine
- The ability to continue its growth as the utility expands wind generation across hundreds of sites and thousands of turbines

Cisco validated designs and secure network connectivity solutions

Bringing critical infrastructure together, Cisco and this U.S.-based utility are modernizing and delivering multiservice grid services, and we are achieving desired business results for:

- Real-time visibility across turbine operations
- Simplified network management from a central location
- Centralized management of physical security for the site
- Reduction in cabling and simplified deployment
- Increased worker safety
- Secure workforce access to tools and resources, both on site and remote
- Reduction in ongoing network operating and maintenance costs

Products involved in this solution (Continued)

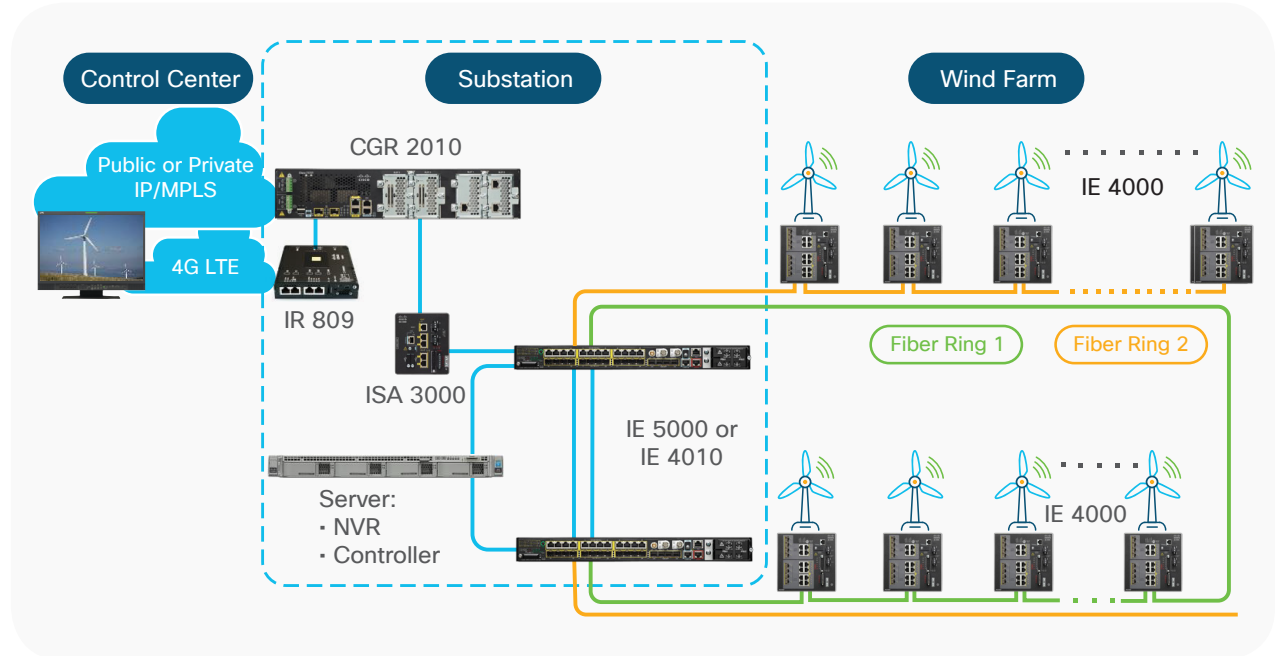


Substation and wind turbine LAN

Cisco Industrial Ethernet switches (IE 4000 or IE 5000)

- Ruggedized form factor supporting IEC 61850-3/IEEE 1613 standards
- Rack mount or din rail installation options
- Power supply redundancy: AC or DC power, including support for substation battery voltages
- High availability: Resilient Ethernet Protocol (REP)
- Prioritization for operational traffic with advanced Quality of Service (QoS)
- Power over Ethernet (PoE/PoE+): connectivity and power to IP phones, surveillance cameras, badge readers, and environmental sensors
- Fog computing (IOx): support for third-party applications without the need for dedicated servers
- Cisco Plug-and-Play (PnP) feature: simplifies deployment and makes sure of consistency across sites
- Swap drive: enables rapid replacement by non-IT resources in the event of a switch failure
- Dying gasp: allows the switch to notify operations when there is a loss of power input
- MACsec: enables encryption for the last mile (turbine to substation)

Figure 1. Wind farm deployment illustration



Why Cisco?

Cisco ruggedized solutions and our enterprise networking portfolio, together with Cisco industry validated designs, enable utilities to rapidly deploy end-to-end architectures for the full range of business and service requirements. With Cisco, you can integrate wind and other renewable energy resources into a centralized management solution. Our solutions are open and standards-based – for ease of integration with Supervisory Control and Data Acquisition (SCADA) systems and diverse assets by

supporting industry protocols. The end result is reliable and secure connectivity with the simple management necessary to deploy and operate distributed assets at scale for successful next-generation energy leadership and innovation.

For more information, visit:

- www.cisco.com/go/utilities
- www.cisco.com/go/ie
- www.cisco.com/go/iox