




## Electrical Utility Builds More Efficient Power Grid Management System

Great River Energy uses communication network to support power management systems and efficiently manage remote substations.

<b>EXECUTIVE SUMMARY</b>

<p><b>GREAT RIVER ENERGY</b></p> <ul style="list-style-type: none"> <li>• Energy</li> <li>• Maple Grove, Minnesota, United States</li> <li>• 894 employees</li> </ul> <p><b>CHALLENGE</b></p> <ul style="list-style-type: none"> <li>• Improve visibility into power grid management network</li> <li>• Increase speed and efficiency of diagnosing and resolving problems</li> <li>• Build network foundation for intelligent power grid of the future</li> </ul> <p><b>SOLUTION</b></p> <ul style="list-style-type: none"> <li>• Deployed Cisco 3200 Series Rugged Integrated Services Routers as the IP foundation of power grid communications network</li> <li>• Implemented centralized security, wireless, and management capabilities</li> </ul> <p><b>RESULTS</b></p> <ul style="list-style-type: none"> <li>• Improved ability to monitor remote substations and resolve issues</li> <li>• Reduced costs by eliminating leased-line circuits and simplifying network engineering</li> <li>• Installed highly flexible, intelligent foundation for future applications</li> </ul>

### Challenge

Great River Energy (GRE) is a private not-for-profit electric cooperative that provides wholesale electric service to 28 energy distribution co-ops, which in turn serve more than 630,000 member/customers. As the second-largest electric power supplier in Minnesota, the utility operates the Great River Energy transmission network, which encompasses more than 600 sites spread across two-thirds of the state, supplying power to thousands of individuals, farms, and businesses.

With such a large, dispersed network, one of Great River Energy's biggest challenges is monitoring the power grid for faults, anomalies, and service disruptions. To support this effort, the organization relies on an Energy Management System (EMS) that continually polls equipment at each site for voltage and power flow information. Maintaining that EMS is critical to serving Great River Energy's customers. By 2008, however, the communication network supporting the application was an aging and difficult-to-manage infrastructure.

"We relied on technologies from a variety of different vendors at each location," says Scott Hughes, senior IT network engineer for Great River Energy.

"If equipment went out, the only way we would know was that data from that site stopped updating in the EMS. We would recognize that we were no longer receiving data, but would not know why."

The network offered little visibility and little means of correcting problems remotely at the unmanned substations. Typically, the only option was to dispatch a technician, sometimes to extremely remote areas that can take hours to reach.

"If something went down, dozens of substations might stop reporting, with little or no information on exactly what the problem was," says Hughes. "Many times, we would send a tech to the wrong site and have to re-dispatch. Even if we found the right site the first time, we'd have to hope he could find the problem. It could be six hours before we could even start diagnosing an issue."

Compounding these problems, the proprietary monitoring technologies at many sites required separate, dedicated communication paths back to the Great River Energy optical backhaul network, which traversed the state. That meant that, even at sites with multiple leased-line connections, visiting technicians had no viable means of connecting with the Great River Energy LAN or management applications, complicating diagnosis and repairs. The dedicated circuits were also extremely expensive, and presented a major barrier to building resiliency into the communications network. The patchwork of technologies from multiple vendors also made security problematic, since the various technologies required their own passwords and security servers, and could not be centralized into a network-wide authentication system.

## Solution

Great River Energy is laying the groundwork for the power grid of the future, an intelligent infrastructure that can transmit power more efficiently and respond to changes in demand in real time. To help support this vision and address the cost and efficiency issues of the present, the GRE network needed a major overhaul.

Hughes and his team recognized that IP could provide an ideal foundation for the EMS network. With a flexible IP infrastructure, Great River Energy could integrate all of the proprietary monitoring systems and management applications into a single infrastructure, and gain much greater visibility and control. However, any IP network solution would need to meet several key requirements.

"We wanted Ethernet connectivity to support future assets that will be Ethernet-enabled," says Hughes. "We also wanted to support wireless access for technicians in the substations, as well as voice-over-IP. The most difficult challenge, however, was finding a solution that could run in an extreme and demanding substation environment."

Great River Energy had long relied on Cisco to support its LAN/WAN infrastructure, as well as the fiber-optic backhaul network. When the time came to build an IP solution for the remote sites, the organization chose the Cisco® 3200 Series Rugged Integrated Services Router as the standard platform for all power grid substations across the state. Deployed with ruggedized enclosures and a radio network that links the substations to the optical backhaul, the versatile Cisco platforms provide an ideal solution.

"Initially, we were looking at six different vendors to provide Ethernet ports, encryption and authentication services, and the other services that we need at these sites," says Hughes. "We realized we would have to manage six different devices at each site, across nearly six hundred sites. We were excited to find a solution where everything was in one package, with one configuration file."

The Cisco 3200 Series routers integrate the various proprietary monitoring systems at the remote substations into a single IP communication network. The platforms also include a Wireless Solution Module that provides secure wireless connectivity, giving technicians access to all of the network applications and resources they need.

“One of the tasks our technicians commonly perform at these sites is to verify the accuracy of the meters and telemetry,” says Hughes. “In the past, a technician onsite would have to sit on the phone with a counterpart at the headquarters and compare what they were seeing on their systems. The process could take hours. Now, technicians can connect over the wireless network and access everything onsite as easily as if they were using a PC at the headquarters.”

The solution also allows Hughes’ team to extend the organization’s existing Cisco security and monitoring solutions to the substations. Instead of relying on remote wireless security and authentication solutions, Great River Energy uses Cisco wireless controller appliances, deployed upstream in the network, and the centralized Cisco Wireless Control System. As a result, the team no longer has to use separate authentication and security monitoring systems for each substation application, but can manage every site using the centralized applications including Cisco Security Manager, the CiscoWorks management suite, and the Cisco Security Monitoring Analysis & Response System (MARS).

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— Scott Hughes, Senior IT Network Engineer

## Results

Today, the Great River Energy power grid is supported by a more streamlined and cost-effective communications network. The ability to support vital EMS applications over the IP network gives the organization much greater visibility into the ongoing status of the power grid, and allows it to be more proactive in and efficient in identifying and responding to problems.

“The actual data transmitted over the network is the same as before, but because it is routable and all the components along the way are managed devices, we can detect problems in the network without having to be there on site,” says Hughes. “We can access real-time performance monitoring for the network and receive proactive daily error reports that let us identify potential problems before they cause a failure. If a component does fail, we can see precisely where the problem is. We can do all of these things from our headquarters now, and if we have to dispatch a truck, we send it to the right place the first time. It’s a huge difference compared to what we had before.”

The Cisco solution is also providing a significant cost savings. The ability to support multiple applications over a single connection has allowed Great River Energy to eliminate many leased-line circuits at the substations, which means a savings of tens of thousands of dollars each year. From an engineering standpoint, Hughes’ team can use a much simpler, standardized design for all substation sites and use standard parts and spares.

## PRODUCT LIST

### Routing and Switching

- Cisco 3200 Series Rugged Integrated Services Router

### Security

- Cisco Security Manager
- Cisco Security Monitoring, Analysis, & Response System

### Management

- CiscoWorks LAN Management Suite
- Cisco Wireless Control system

“We no longer need to develop and maintain a telecommunications solution for each proprietary application at the substations,” says Hughes. “We use one solution for all applications, and that translates to a major savings in engineering resources.”

The inherent resiliency and failover intelligence of IP has also made the network more resilient. And, the centralized security capabilities make it more secure and easier to manage.

“The new system makes it much easier to audit security and document compliance,” says Hughes. “Other options would have given us many more devices to monitor. Standardized platforms and the management tools allow us to really automate that process.”

For the long term, however, the most important advantage of the new communications network is its flexibility. With the ability to monitor and manage all sites in the network as a single system, Great River Energy is prepared to begin building a greener, more efficient power grid solution for its customers.

“To accomplish a ‘smart grid’ implementation, you need to have intelligence distributed throughout the network,” says Hughes. “This communication network is the first step in that process, and provides us with a flexible network that will support new applications.”

## Next Steps

In the coming months, Hughes’ team will continue to expand the Cisco communications network supporting the electrical substations. In the near future, the team plans to deploy new applications at these sites, including limited voice services and even physical security and video surveillance at some locations. With native support for Ethernet and Unified Communications, the Cisco platforms will provide a versatile, scalable foundation for accommodating these and other new applications as the network evolves.

## For More Information

To find out more about Cisco 3200 Series Rugged Integrated Services Routers, visit:

<http://www.cisco.com/go/3200>



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