SIEMENS

Case Study

RUGGEDCOM CROSSBOW system and application modules enable secure, remote access to transmission substations and IEDs in the field

Customer: Black Hills Power serves nearly 70,000 residential, commercial, agricultural and industrial customers in 20 communities in the three-state area of western South Dakota, northeastern Wyoming and southeastern Montana.

Challenge: For reliability, safety and operational efficiencies, Black Hills Power needed secure, remote access to transmission substations and IEDs in far-flung field locations.

Solution: The Siemens RUGGEDCOM Crossbow solution enabled secure, remote access to a selected transmission substation and related IEDs, with stringent, role-based authentication and verification for access, as well as automated device password and configuration functionality.

Results: Black Hills Power gained secure, remote access to transmission substations and IEDs in the field, reducing travel-related costs, staff time and security-related vulnerabilities, while increasing the speed of event forensics and mitigating actions.

Anyone who has crossed the northern Great Plains where South Dakota meets Wyoming and Montana has experienced the vastness that characterizes this region. The Black Hills, home to Mount Rushmore, rise west of Rapid City, South Dakota, but undulating plains dominate the landscape. The region is hot and dry in summer, cold and dry in winter. In any season, storms can imperil the most intrepid traveler.

Black Hills Power, headquartered in Rapid City, serves a territory that sprawls over a couple thousand square miles of this three-state area. This investor-owned utility, a subsidiary of Black Hills Corporation, serves nearly 70,000 customers in 20 communities that dot the region, including residential, commercial, agricultural and industrial interests.

Black Hills Power, which has served the region since 1883, today enjoys a reputation for an efficient workforce and forward-looking management of its operations and assets.

But managing and servicing transmission substations spread across the Great Plains can be a daunting task. Imagine the potentially harrowing journey of a service technician dispatched in the dead of a winter night from Rapid City headquarters to a transmission substation in Belle Creek, Montana, more than 150 miles away.

usa.siemens.com/ruggedcom

Thus it is not surprising that Black Hills Power – based on efficiencies and related cost-savings alone – would seek secure, remote access between its control center in Rapid City and its far-flung transmission substations. Though the utility operates a SCADA system over fiber optic cable that monitors substation conditions, the utility needed a more sophisticated means of managing these critical assets.

Siemens' RUGGEDCOM Crossbow solution offered Black Hills Power remote access to its transmission substations, along with applications that enable IT security best practices and assist in meeting current and future regulatory mandates.

Black Hills Power decided to initially implement Crossbow in one transmission substation to become familiar with the solution, understand how to integrate it with existing systems, train staff and explore how to scale Crossbow across its service territory.

 "There are internal ways that we could open up a connection to the substation in question, but nothing with the attributes of the Crossbow system," said Brandon Olsen, an IT Technical Project Manager at Black Hills Power. "We couldn't duplicate Crossbow's authentication and verification methods, its configuration management abilities and its logging functions. Crossbow is highly secure."

"Right now our remote access to our substations is fragmented," explained Brian Kittelson, a Senior Electrical Engineer and the utility's business owner for electric engineering in transmission and distribution. "We've got several different methods for accessing them. Our long-range goal is to get everything moved over to the Crossbow system so that we have a uniform approach across two electric utilities."

RUGGEDCOM Crossbow offers secure, remote access. As Black Hills Power discovered, the Crossbow solution addresses the need for utilities to interactively communicate from a central location with remote field IEDs for maintenance, configuration and data retrieval. In fact, Crossbow's centralized access differentiates it from other, substation-based solutions. For a largely rural utility such as Black Hills Power, centralized access to substation IEDs is quicker, more secure and less costly than dispatching field crews to distant locations.

Kittelson explained the value of these operational efficiencies.

"When an 'event' occurs, it's usually a drop-everything-you're-doing fire drill," he said. "It doesn't matter what time of day or night it is or whether it's on the weekend. When I get that call, I need information as soon as possible. In many cases, these are emergency situations where we don't want to wait five hours for that technician to reach a distant substation. With access to the substation from my office in Rapid City, I can get inside a protective device, which has its own event-recording and data-logging capabilities. I'll pull reports, take a look, and try to decipher why that device tripped."

Crossbow application modules (CAMs) add functionality. Black Hills Power purchased the full array of CAMs for Crossbow, confident that all three will aid the utility in multiple ways. The Secure Access Manager provides a secure, centralized means of authentication and verification for users logging onto the system, providing not only security but also enabling the utility to meet current and pending NERC CIP requirements, according to Olsen and Kittelson.

The Configuration Access Manager provides an automated means of polling IEDs in the field to check whether their configurations are up-to-date or require updating, with significant savings in time and cost for a utility with a

sprawling service territory, such as Black Hills Power. Similarly, the Firmware Application Module provides Black Hills Power with a central means to revise firmware on hundreds of field IEDs without dispatching field crews.

Physically, the Crossbow system runs on a Crossbow Secure Access Management server and a number of desktop or laptop computers at the utility's Rapid City headquarters. The server contains the system database, based on Microsoft SQL Server, and manages all connections from the clients to IEDs in the field.

Crossbow productivity gains. Crossbow's automated IED password management capabilities clearly save time and money, according to Kittelson. Without this functionality, the utility's technicians would be required to manually change passwords for hundreds if not thousands of IEDs in the field and record their actions, he pointed out.

The reduction in field trips for manual tasks that are now automated by Crossbow frees up the utility's transmission substation technicians for higher priorities, which include troubleshooting system reliability issues at the core of the utility's mission, Kittelson added.

"A subsequent reduction in "truck rolls," fuel costs and staff time produces significant savings in the utility's operations and maintenance budget, Olson and Kittelson said. Those cost reductions, as well as improvements in staff productivity and system reliability, will be documented and factored into the utility's business case for expanding Crossbow across the Black Hills Power service territory, both men agreed.

Crossbow aids forensics and accountability. The Crossbow system logs every keystroke to create a record of who did what and when they did it – a capability Black Hills Power has never had, according to Olsen. Thus the system aids security and accountability by creating a record of every staff member's actions.

And Crossbow's extensive data logging capabilities include fault records that reflect the device's configuration, voltages, amperage and other operational data, and identifies staff who worked on the device. These capabilities enable accurate forensics in identifying issues and, thus, support rapid solutions.

Crossbow's intuitive business case. For Black Hills Power, the efficiencies, forensics and future capabilities enabled by Crossbow and its application modules presented a straightforward business case, according to Olsen.

"The business case was a 'no-brainer,'" Olsen said. "Our substation technicians can travel hours to fix something that only takes a minute. So for the cost of the solution, it wasn't a difficult business case to get approved. It was a simple matter of understanding what workers have to do today and what this solution can resolve. It was an easy win."

Crossbow capabilities meet future regulations. Crossbow's data and event logging capabilities assist utilities in complying with existing NERC CIP requirements for the documentation of security-related measures. (NERC CIP is the North American Electric Reliability Corporation Critical Infrastructure Protection program.)

The Crossbow solution also will help the utility comply with future NERC CIP mandates for managing, securing and reporting on remote access. According to Olsen, that future-oriented functionality will mean Black Hills Power will be prepared when NERC CIP revisions are enforced, as expected, in 2016.

Though regulatory compliance, particularly regarding NERC CIP, was not a major driver of the utility's initial Crossbow implementation, Olsen said, "it was one of the added benefits of the solution." And that benefit is likely to grow, going forward. NERC CIP version 5, slated to take effect in 2016, requires a "jump" or intermediate server that authenticates and verifies access. Crossbow's Secure Access Management server fits the bill.

"If we can meet NERC CIP standards that happen to fall within this project's scope, then we're ahead of the game," Olsen said. "And we would rather be ahead of the game. If NERC CIP version 5 comes out and these assets become qualified [i.e., subject to NERC CIP compliance], then we're fine. Because we can produce all the record keeping they're going to need."

Crossbow's myriad features provide tangible value. The combined benefits of Crossbow are clear to Olsen and Kittelson at Black Hills Power.

"Having secure, remote access to all of our substations is very valuable," Kittelson said. "Any of these locations could require up to a five-hour drive for a technician to reach. And some locations may not be reachable in winter. To understand what's happening when something goes wrong at 2 a.m. on a Saturday morning is highly valuable.

"So are the tools that Crossbow offers through its application modules such as managing passwords on our field devices, keeping track of configuration changes in the devices, and keeping track of access to those devices," Kittelson continued. "Until now, managing and recording device passwords had been a manual process. That's impractical.

"In fact," Kittelson added, "that was a key selling point on Crossbow – that it can perform password management for us, and report on it. I can imagine a future NERC CIP audit in which they ask us about that. And with a push of a button we can ask Crossbow to generate a report that will support the fact that we changed all the passwords on a certain date."

Results: Secure, remote access to transmission substations and IEDs in the field has reduced travel-related costs, staff time and security-related vulnerabilities, while increasing the speed of event forensics and mitigation actions.

Black Hills Power's IT staff worked closely with the business owner to ensure that a one-day Siemens-led training session on the utility's Crossbow implementation went smoothly. "The implementation was fantastic," Olsen said. "It couldn't have gone more smoothly."

According to Olsen, Black Hills Power will document Crossbow-enabled improvements in security, reliability, operational efficiencies and regulatory compliance to articulate a future business case for the solution's expanded use across two electric utilities.

usa.siemens.com/ruggedcom