

Strategic Sourcing Case Study:

Prairie Power's Broadband System Enabled Wide Area Network

The Sourcing Need

In 2010, the communications network that Prairie Power Incorporated (PPI), a generation and transmission company (G&T) based in Springfield, Illinois, relied upon to monitor transmission operations throughout its large service territory was reaching a breaking point. The frame relay network used for supervisory control and data acquisition (SCADA) field communications was unable to maintain connectivity during weather events, often being knocked out for days after a storm. The outdated communications network was negatively impacting the G&T in other ways, from general connectivity with its ten distribution cooperative members to limiting the future capabilities of its SCADA system due to bandwidth constraints.

The Sourcing Solution

Through a formal Participation Agreement with telephone cooperatives in its service territory, Prairie Power upgraded its communications system to a broadband network largely based on fiber optic technology. With the powerful backbone system in place, PPI has launched a host of new services to benefit its members, including centralized distribution SCADA, infrastructure as a service (IaaS), and IT cybersecurity services. Joseph Smith, chief technology officer at PPI, refers to the robust network, which utilizes cellular and microwave technologies in addition to fiber technology, as PPI's Wide Area Network (WAN).

Ed VanHoose, an IT expert and CEO of Clay Electric Cooperative in Illinois (not a member of PPI) says that the PPI network is a remarkable achievement. "I don't know of another network in the country like it," he says. "By working with for-profit companies, telephone cooperatives, and its own members, the G&T found ways to utilize assets already in place, instead of over-building in areas where fiber existed. In this way, Prairie Power was able to save a huge amount of money. It is a model the rest of us could learn from and adopt for our cooperatives."

Project Background

By 2010, Prairie Power line personnel had taken to carrying two or three cell phones in their trucks, each phone connected to a different carrier to attempt to stay in radio contact while traveling throughout the G&T service area. This piecemeal approach to maintaining communications was more than an inconvenience; it raised safety concerns during outage situations, when all crews needed a reliable connection. Severe storms would also cause outages to the frame relay network and, as a result, taking the SCADA system off-line right when it was needed the most.

PPI canvassed the needs of its members as it analyzed options for a new communications system. A consultant study focused on a choice between a fiber or microwave network. Then-CEO Jay Bartlett (now CEO at Wabash Valley G&T in Indiana) had seen the positive difference a fiber broadband system could make when he worked at the Springfield, Illinois municipal utility. Out of the gate, a fiber network, being

non-conductive, would be much less susceptible to outages. It alone had the capacity to be “future-proof” – able to support the evolving communications and technology needs of the G&T and its members. But, the cost estimates for a fiber buildout topped \$20 million, substantially more than the alternative of building a microwave network.

In 2011, PPI considered plans to install a microwave-based network to replace the frame relay network. More than 100 microwave towers would have to be built to cover PPI’s territory. Microwave technology offers an improved foundation for SCADA, but limited support for newer smart grid technologies. PPI considered microwave technology an interim step with fiber still the long-term solution.

PPI was already deploying fiber in small increments, adding fiber whenever it replaced or rebuilt transmission lines. A PPI crew installing fiber noticed that a crew employed by the Adams Telephone Cooperative was doing the same thing on the other side of the road from PPI’s lines.

Smith, who joined PPI in 2011, says the accidental discovery raised questions. Why are two cooperatives each putting in fiber in the same location? Could we avoid this duplication and save money? “It seemed like a natural opportunity to practice one of the cooperative principles, cooperation among cooperatives,” Smith says.

A meeting between PPI and the telephone cooperative followed. It turned out that the state’s telephone cooperatives, focused on bringing broadband service to rural homes and businesses, were well along on a deployment of fiber through much of the PPI footprint. At one time, the telephone and electric cooperatives in Illinois had been more closely aligned, some even sharing headquarters. Broadband rekindled a sense of mutual interests and led to the launch of a fiber consortium in 2012 between PPI, Adams Telephone Cooperative, McDonough Telephone Cooperative, Mid Century Telephone Cooperative, and one non-cooperative company, Cass Communications.

Under the consortium, PPI has built fiber, but it also pays for access to the much larger network already built by the telephone cooperatives. As a result, it has been able to establish a fiber connection to nine of its distribution cooperative headquarters and virtually all the PPI transmission substations, and some member distribution substations at a cost substantially lower than the original estimates.

The new communications system is almost 100 percent complete, but upgrades will continue over time as PPI makes improvements to its transmission system. The G&T is well on its way to establishing redundancy – the ability to find alternate paths to maintain service during outages – on both the electric power and the communications infrastructure.

How Prairie Power’s New Network Has Improved Operations

PPI switched to the new network in late 2013 and the impact on the G&T’s operations has been “dramatic,” says Smith. The fiber provides direct connections between relays remote telemetry units (RTUs) at substations on the transmission system. “We have had sites on for five years with virtually no loss of availability. The difference in reliability is huge – it’s night and day. It provides an awareness of our transmission system that we did not have before.”

Improvements in reliability and operations on the transmission and distribution systems through the deployment of intelligent electronic devices (IEDs) are enabled by the broadband communications network.

Among other functions, the IEDs track voltage, current, and power quality with precision, reducing truck rolls, and saving money.

While the new system relies primarily on fiber, PPI has been able to successfully use cellular communications to establish improved connections with less critical sites. PPI's Smith notes that cellular is used to operate switches rather than breakers on parts of the transmission system. Cellular also offers a 'plug and play' versatility not possible when the system was provisioned with copper telephone lines. Microwave is also used in a handful of locations as a stop gap until planned transmission line rebuilds take place, after which PPI will convert the microwave sites to fiber.

PPI's Wide Area Network Supports New Services

PPI is using its broadband network to support several new services for its member cooperatives, which include:

- A centralized distribution SCADA. Historically, the distribution cooperatives maintained individual SCADAs that connected system assets. Now, PPI offers a centralized option. Remote terminal units (RTUs) at each substation collect field data which is aggregated at member offices and sent to PPI using the PPI fiber WAN. Monitoring of each member system is performed around the clock by PPI's dispatch center. Each cooperative has access to graphical and tabular information about their respective system, both in the office as well as on mobile devices. Previously, SCADA data could not be accessed in the field.
- The PPI Cloud. This robust virtual machine infrastructure includes servers in two locations (for redundancy) that can offer a complete primary and secondary IT infrastructure for PPI Member cooperatives. Member cooperatives reduce hardware investments and gain "virtualization benefits" – increased flexibility, capability, and security, especially for members that had previously been using outdated hardware and software platforms.
- Improved Communications. Use of fiber to bolster PPI to member cooperative radio communications, which includes the ability of PPI to do switching operations through radio bridges and improve centralized communications during weather events.
- IT services. PPI has two staff dedicated to its member cooperatives who provide a variety of IT functions, including security and support services.
- Co-location services. Licensing restrictions limit the ability of some cooperatives to shift software to the cloud. PPI offers physical co-location for these cooperatives to house any primary or secondary servers at PPI's offices.

Mike Smith, CEO at McDonough Power Cooperative of Macomb, Illinois says that PPI's fiber network has "really elevated our game in cybersecurity and IT." Through the PPI Cloud, PPI hosts most of McDonough Power's servers, managing the underlying IT infrastructure in a service-oriented fashion, while "saving us money on a server we didn't have to buy." Two years ago, when a ransomware attack locked the distribution cooperative out of its files, PPI worked over the July 4th weekend to restore the cooperative's data and business operations. PPI now provides baseline IT security services to McDonough Power and other member cooperatives to help detect and remediate common security issues. These services utilize the PPI fiber WAN to provide communications for the supporting security infrastructure.

Mike Ohnemus, GIS coordinator and IT specialist at Adams Electric Cooperative of Camp Point, Illinois, notes another service from PPI that makes a huge difference – serving as the Internet Service Provider (ISP) for nine of the distribution members. “PPI can block malicious traffic at the edge routers before it hits our firewall. A normal ISP, with thousands of individual customers could never provide that level of protection.”

Surprises and Challenges

The biggest challenge for PPI was to solve a critical communications problem in a way that was affordable for a smaller G&T while providing the 21st century capabilities imperative for utilities of any size. The biggest surprise was stumbling almost by accident on a solution that drew upon a core principle of cooperation among cooperatives.

Jim Thompson, general manager of Adams Electric Cooperative, noted that the lack of reliable communications from the office to the substation and with PPI had hampered his cooperative on several fronts, including effective disaster recovery and an upgrade of its network enterprise software. “From a strategic standpoint, PPI’s reliable fiber communications allowed us to push forward and do things we had wanted to do for years,” he says.

Metrics of Success

1. The unit of measurement used to track PPI’s SCADA communication outages changed from days to minutes with the implementation of the PPI fiber network.
2. The PPI Cloud provides members with application and infrastructure cost savings, while also improving redundancy and recoverability of critical operational and business systems.
3. The PPI Fiber WAN is a foundational technology that is leveraged to provide remote IT services to PPI members without a perceptible delay in response due to the minimal latency in fiber communications. This level of performance and increased capability allows the G&T and distribution cooperatives to integrate at many levels, ultimately creating value for the Members at the end of the line.

What’s Next For Prairie Power’s Shared Services

In the view of Adams Electric’s Jim Thompson, “the relationship between PPI and the distribution co-ops needs to be even more integrated as we move forward.” He says that building out distribution automation will take time, “but without PPI being a part of it, we would never be able to do it. All of the distribution co-ops can utilize services from the G&T to bring more value to members at end of line. I think you’ll see more products offered from PPI to the member systems going forward.”

Cooperative Profile



Prairie Power Incorporated (PPI) is a generation and transmission (G&T) cooperative headquartered in Springfield, Illinois, with a district office in Jacksonville. It is owned by ten distribution cooperatives that serve a total of 78,000 member-consumers in 46 counties in a band across south-central Illinois from Indiana in the east to Iowa in the west. PPI maintains 590 miles of transmission lines and 79 distribution and transmission substations. It owns 141 MW of oil and gas-fired peaking power plants, and a share of the Prairie Power Generating Company power plant equivalent to 130 MW of supercritical coal generation. PPI also owns 20 MW of wind and two 500 kW community solar projects.

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