



Electric Energy T&D

MAGAZINE

MARCH-APRIL 2009 Issue 2 • Volume 13

Smart Grid Takes Flight at Crow Wing Power

How a project to wirelessly connect rural substations helped one co-op deliver 2-way advanced meter reading and discover a shared utility network, laying the foundation for future smart grid applications

By Todd O'Hotto, IT Manager | Crow Wing Power

Crow Wing Power, an electric cooperative serving 36,000 members in rural north central Minnesota, recently reached the one-year mark in a project implementing a 700 MHz licensed wireless broadband communication network from Arcadian Networks. A project that began with a simple push to update infrastructure to support substation automation communications, advanced metering, and energy efficiency programs, has grown into a smart grid movement among rural electric co-ops belonging to Great River Energy. By leveraging infrastructure already deployed by Great River Energy, Crow Wing Power has been able to address current challenges and move its two-way infrastructure communications technologies to the forefront of smart grid readiness.

Communications Challenges

Crow Wing Power faces obstacles familiar to many rural electric co-ops throughout the United States. In fact, statistically, Crow Wing Power is the typical rural electric co-op, serving approximately seven customers per line of power, which is the national average, according to the National Rural Electric Cooperative Association (NRECA).

With most residents of Minnesota's eleventh-fastest growing county depending on them for reliable power, Crow Wing Power must deliver electricity – and communicate – with an infrastructure built on technologies put in

place more than seven decades ago, when the co-op was formed following the Rural Electrification Act of 1936.

The climate and terrain in the north central region of Minnesota place further demands on Crow Wing Power. Communications to substations must be reliable, whether during a February blizzard or an August scorcher. Crow Wing Power delivers power across more than 4,700 miles of lines.

While connectivity from substations to homes was provided by a Landis+Gyr two-way advanced metering solution, ensuring two-way communications from those substations back to the co-op control room remained an obstacle in 2007.

The Search for a Solution

Long interested in improving its load control efforts, Crow Wing Power's leadership began to realize that the road to fulfilling their smart grid aspirations lay in addressing communications to their substations in the field. The project began in earnest in August 2007, as Crow Wing Power explored ways to expand on its two-way advanced metering programs while updating communications with its rural substations.



Figure 1: Arcadian Networks' "plug & play" equipment was installed quickly to link 25 Crow Wing substations

Major concerns were security and reliability in distribution substation system communications. Early on, they had investigated a variety of alternative communications technologies, including a microwave system.

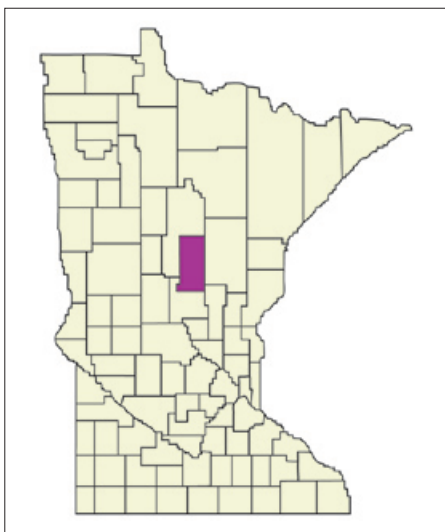


Figure 2: Crow Wing County is located in the scenic, but sometimes challenging, terrain of central Minnesota.

An Intriguing Offer

As the search continued, however, Crow Wing's power supplier (Great River Energy) approached the utility with an innovative proposition -- a solution already in use at other Great River Energy members, including Connexus, Todd-Wadena, and Agralite Electric. The proposal would allow Crow Wing Power to join a community of utility users deploying a 700 MHz licensed wireless communications network. Great River Energy, already using the network in their communications, would allow Crow Wing Power to piggyback onto its equipment. Crow Wing Power readily welcomed the concept for several reasons.

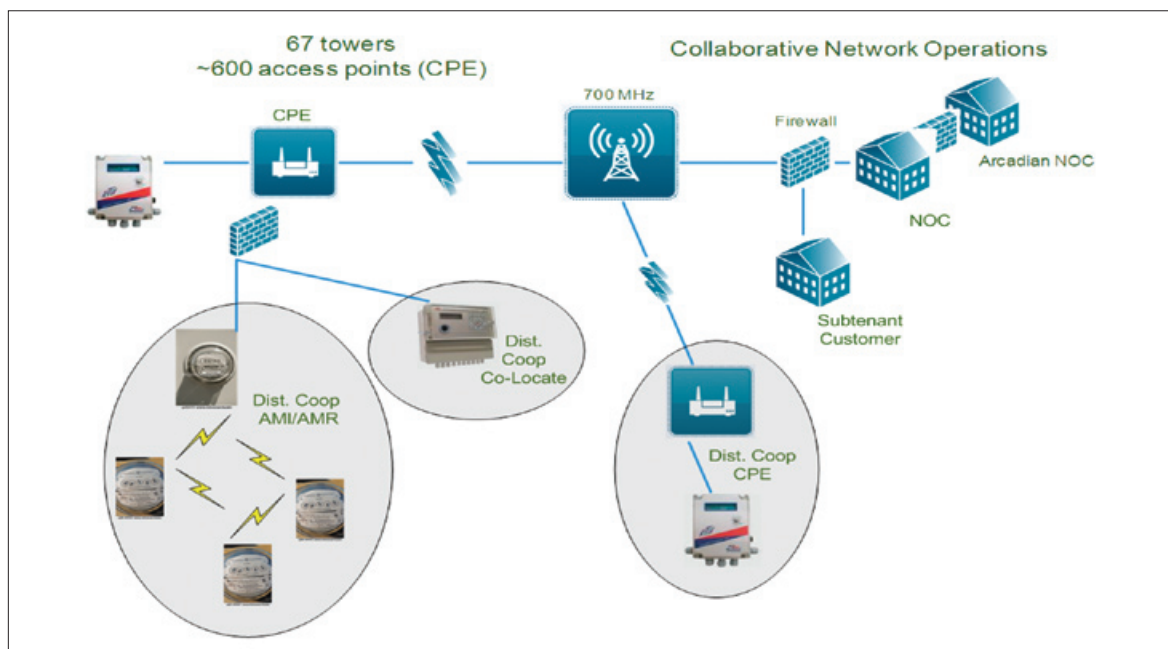
In addition to the savings on equipment and maintenance costs, they could expect a further benefit -- avoiding the expense and difficulty of plowing the often-frozen Minnesota soil to bury lines. And, Crow Wing Power could easily investigate the success of the technology at their fellow Great River Energy co-ops before launching it themselves.

challenges in upgrading the communications capabilities at all of its power stations. Connexus Energy's legacy communications infrastructure had been built around a private frequency, which was burdened by slow, overloaded lines with limited bandwidth. Security and reliability had become major concerns. With Great River Energy's support and Arcadian's network solution, by the end of 2007 Connexus had converted 20 substations to 700 MHz, with plans to continue rolling out SCADA to all substations over the next four years.

Crow Wing Power decision makers found the Great River Energy offer increasingly compelling as it became clear they could achieve the efficiency and reliability upgrades they wanted by simply plugging into the Arcadian network connection ports. The wireless network would meet the need to communicate across a widely dispersed service territory, and it appeared that the installation would be far easier than anticipated. Best of all, Crow Wing Power could contain costs while investing in a proven private network specifically designed to serve the energy space and already in use across their rugged and challenging central Minnesota terrain.

A Community of Utility Users

Earlier that same year in the spring of 2007, Connexus (the largest customer-owned electric utility in Minnesota) had faced similar



Deployment

Beginning in October 2007, Crow Wing Power began connecting to the 700MHz licensed broadband network for two-way wireless data communication with 25 substations, supplying approximately 55,000 member customers. Communicating with Arcadian's network was fast and efficient, due extensively to its highly interoperable features. Within minutes of installation, engineers were able to provision modems and set up full operation on the network. (Great River Energy actually installed the units.)

Most substations were up and running by June 2008. Working aggressively to finish infrastructure improvements before winter 2008, the Crow Wing Power team began to see immediate benefits from the new 700MHz communications platform. Moreover, engineers reported it was not only possible, but relatively easy, to get the wireless system up and running.

Bridge to a Smart Grid Future

Crow Wing Power knew the future depended on the ability to have high-speed, two-way communications and control with their substations. But achieving that goal took some investigation and some innovation to make it a reality. The 700 MHz licensed wireless IP communications network turned out to be a smart choice for achieving those goals.

Reliability: Like Connexus, a neighboring utility with estimated up-times of nearly 99 percent, Crow Wing Power has seen increased reliability and faster data delivery. A year into the project, data delivery has been consistent, even in the worst of winter freezes and storms.

Load Control: The co-op has succeeded in supporting high-speed communications for critical peak load control voltage management programs coordinated with Great River Energy. They have also expanded their capability and reliability for two-way advanced metering backhaul and more.

Applications Accessible: Installing the equipment, Crow Wing Power noted the potential to interconnect with virtually any present or future applications, including AMI, VoIP, SCADA, and WIFI. They all hook into the Arcadian network, opening a window to a variety of smart grid projects and promising increased efficiency and further cost benefits in the future.

By deploying substation communications over their new 700MHz network, Crow Wing Power has found a reliable way to support delivery of substation automation communication, advanced metering, and energy efficiency programs. By participating as one member of a shared, multi-utility, multi-application network in a community of utility users on this network, the utility can also leverage assets already deployed by others to effectively update its own communications infrastructure.



Figure 4: Arcadian field teams worked closely with Crow Wing Power crews to connect the first of 25 substations to the 700MHz network in 2007 and complete the remainder by the end of 2008.

Looking Ahead

Crow Wing Power looks forward to building on the communications platform with new load control initiatives rolling out for 2009. The wireless network has provided a base on which to build future smart grid applications that will control costs and increase security.

The 2-way 700MHz implementation also reduces the co-op's cost to supply power, which should help keep charges low for its members. The network has proven itself to be a secure and reliable foundation for smart grid innovations -- and smart business in support of Crow Wing Power membership. ■

About the Author

Todd O'Hotto serves as Manager of Information Technology for Crow Wing Power.



ARCADIAN
Networks

The SMART Network Choice™

www.arcadiannetworks.com
info@arcadiannetworks.com
914.579.6300