

87 - Fiber-enabled Smart Grid Solutions

Eric Murray

A New Breed of Cooperative

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A New Breed of Cooperative

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A New Breed of Cooperative

An electric utility and telecom unite to provide a future-proof communications approach that delivers Internet, phone, television and smart grid connectivity.

NineStar Connect was created on Jan. 1, 2011, the result of a merger of two progressive cooperatives: Central Indiana Power (CIP) and Hancock Telecom. While this convergence of a utility and telecommunications provider may seem unusual to some, it is actually indicative of a growing trend in the industry. As the smart grid continues to develop across the country, utilities and telecoms are realizing that, by merging, they can unlock operational synergies, open new revenue streams and improve the quality of service provided to customers.

CIP was an electric cooperative serving 12,000 families, businesses and farms just 25 miles (40 km) east of Indianapolis, Indiana, U.S. Hancock Telecom served about 6,000 customers in an overlapping geographic area. Having merged into NineStar Connect, they now collectively serve more than 15,000 customers. NineStar Connect covers one of the fastest-growing service areas in the state, maintaining more than 950 miles (1,529 km) of power lines and a 21st century fiber-to-the-home (FTTH) network that delivers unsurpassed Internet, phone, television and smart grid connectivity throughout the region.

The merger's origins can be traced to May 2007 when CIP, recognizing the changing nature of the electric power industry, was investigating the benefits of a smart grid rollout. While a strong dedication to serving customers was the leading factor in the project (CIP prides itself on crew members, who are among the most highly trained in their field and demonstrate an unwavering commitment to responding quickly to outages and service interruptions), CIP's grid upgrade was also motivated by demand-response initiatives proposed by Wabash Valley Power Association, which provides power to CIP and other utilities in the region. From a broader read, CIP was pursuing a progressive plan that would transform and improve the way energy is distributed, monitored and used throughout the area.

Risk Mitigation: Choosing Fiber for Communications

CIP considered many different paths for integrating the smart grid into its service area and had to decide whether it should house its network on a wired or wireless communications backbone. Closely examining a variety of factors — including coverage capabilities, deployment efficiency and cost per read — CIP eventually choose a wireless 220-MHz system. The radio-frequency network provided territory wide, two-way coverage using just a single antenna and afforded all the functionality to meet its current and foreseeable needs.

However, when talk of a merger opened up the opportunity to use broadband as the backhaul method, CIP began to see the immense potential for the network using this medium. While wireless has its advantages, fiber offers virtually limitless bandwidth, extremely robust connectivity, low fixed costs and a high level of security.

Over the past few decades, the utility industry has come to realize that communications

networks, especially those designed to reach all consumers, need to support more than just metering capabilities. The evolution from automated meter reading to advanced metering infrastructure to demand response and beyond requires networks to work harder and faster, and carry bigger data payloads as more and more advanced functionalities make their way onto the electric grid. The same network that delivers kilowatt-hour usage, outage notifications and power-quality measurements today will be used tomorrow to transmit demand-response and load-management messages (with opt-in or opt-out verifications), price alerts and green energy notifications, and convey commands in a split second to optimize distribution equipment performance.

Currently, most smart grid projects are built around the need to solve existing problems and those on the immediate horizon. Utilities generally have been proficient at estimating their near-term communications needs, but future demands may be difficult to quantify because of the rapid pace of evolution in grid technologies and applications. And how does a utility attach a value or cost to addressing these future needs?

With fiber, NineStar Connect's grid communications system is virtually future-proof. By taking into account future demands on the electric grid before investing in a communications network, CIP proactively mitigated the risk inherent in any infrastructure investment. By choosing fiber, CIP can rest assured it will be able to adapt easily to the shifting energy landscape.

Leveraging Existing Fiber Infrastructure

With the goal of extending the smart grid to all end users in the most efficient and cost-effective manner, CIP partnered with Hancock Telecom to leverage Hancock's already established FTTH network. Hancock was early to recognize fiber optics' potential to enable better service and generate additional revenue.

Fiber opens up more revenue streams by allowing telecoms to offer additional services to their customers. While fiber has been used for communications for many years, Hancock was one of the first providers in Indiana to introduce fiber to residential customers, activating its first end user in 2003. With the introduction of a FTTH network, Hancock was able to offer lightning-fast broadband speeds — about 60 times faster than a cable modem — at affordable rates.

Fiber optics allows many features that slower connectivity would make frustrating, such as home-based Web servers, high-definition television (HDTV) and full-motion video conferencing.

While fiber does offer the potential for additional revenue, it also is worth noting that it is expensive infrastructure with high upfront costs. In addition to the process of laying the actual wiring in the ground, fiber networks have unique hardware requirements on both ends. Hancock also had to take on additional staff to manage increased customer interaction as a result of the project and new service offerings. Consequently, it made good economic sense for Hancock to seek out a partner to help shoulder some of the costs associated with its FTTH network.

With overlapping service areas and the need for similar infrastructure, CIP and Hancock soon recognized the potential synergies between electric utilities and telecommunications providers. Using existing fiber infrastructure for smart grid services

was the logical next step for accelerating smart grid rollout. By employing the same fiber used for high-speed broadband connectivity to bring advanced energy management capabilities to rural customers, CIP and Hancock avoided the additional cost and complexity of installing and maintaining two separate networks. In fact, by sharing maintenance and management costs, both parties benefitted from lower overall expenses. Additionally, CIP and Hancock consolidated cost-intensive operations like billing, mapping, accounting and customer service across both organizations. This collaboration represented the first major partnership between a telecom and utility for a smart grid deployment that also serves end users.

With significant operational overlap and numerous cost-saving synergies within reach, CIP and Hancock began discussing a merger in 2009. After Indiana law was amended in early 2010 to allow electric and telephone cooperatives to combine, the boards and cooperative members of both organizations approved the merger later that year by an overwhelming majority. This utility-telecom alliance creates a new breed of cooperative.

Although CIP did not receive federal grant money, the deployment ties together the objectives of both the Department of Energy's American Recovery and Reinvestment Act smart grid stimulus program and the Department of Agriculture's broadband initiative program by bringing high-bandwidth communications and advanced energy management capabilities to a rural community.

Future-Proofing Smart Grid Infrastructure

With the fiber infrastructure already in place, CIP began to implement a cost-effective smart grid communication network that extended to all of its customers, even those located in rural areas characterized by tough terrain.

In 2010, CIP became the first rural electric cooperative to surpass triple-play communications services — voice, Internet and TV over a single data connection — deploying a Tantalus network, which leverages the FTTH infrastructure for smart grid applications. Tantalus' technology allowed CIP to take utility trucks off the road by enabling automated meter readings, outage detection and disconnect/reconnect procedures.

The high-bandwidth platform gives CIP lightning-fast, two-way communication with every device in its distribution system. While some may think a network this robust is overkill for metering alone, CIP realized that fiber is essential for tightly coordinated load-shedding activities and 24/7 power-quality monitoring, as well as for the split-second responsiveness required by distribution automation, outage detection and disconnect/reconnect procedures.

With virtually limitless data capacity, NineStar Connect's network will not become congested as thousands upon thousands of smart meters and smart appliances join the network and as data-intensive communications with these devices becomes more frequent.

Moving Forward With Smart Grid Rollout

It has been known for a long time that broadband opens the door to fantastic entertainment, educational and economic opportunities. When used in combination with

smart grid technology, this broadband network will enable NineStar Connect to introduce new programs that support its core goals:

- Increasing operational efficiencies
- Helping members save money on their monthly bills
- Improving customer service.

In combination with the Tantalus network, NineStar Connect began installing Tantalus smart meters as part of its first phase of smart grid rollout. By 2012, all of NineStar Connect's electric customers will have smart meters installed. NineStar Connect is committed to continuing the extension of its FTTH network to new customers and unserved areas, especially those still relying on wireless communications.