

Broadband Case Study: Jo-Carroll Energy & Sand Prairie Broadband



Cooperative Profile

Jo-Carroll Energy (JCE) is an electric, natural gas and broadband cooperative serving more than 26,000 accounts in four northwestern Illinois counties close to the Wisconsin and Iowa borders. Its service area generally follows the course of the Mississippi River as it flows south (see Figure 1). With a staff of 84, the cooperative serves small businesses and industries, farms, year-round and seasonal homes, including recreational cabins. JCE's energy infrastructure includes 2,432 miles of electric distribution lines and 304 miles of natural gas pipelines, the latter in parts of two counties.

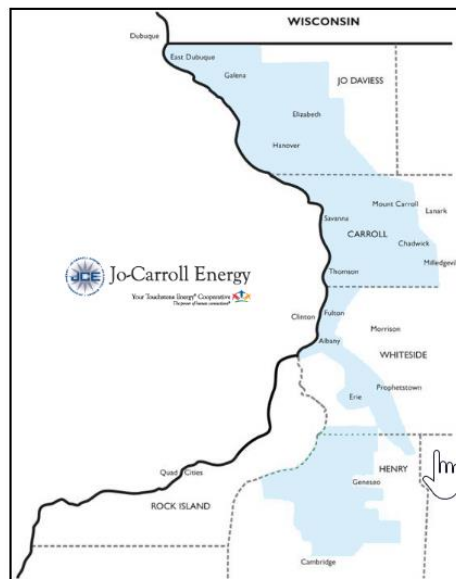


Figure 1: Jo Carroll Service Area
(www.jocarroll.com)

Sand Prairie, the broadband business division JCE created in 2008 to enable communications with its supervisory control and data acquisition (SCADA) system and its advanced metering infrastructure (AMI), operates in parallel with its electric and gas divisions and offers high-speed Internet access to 1,800 members via fiber-to-the-premises (FTTP) and fixed wireless services.¹ JCE's business plan, which originally

¹ Unlike some other electric cooperatives, Jo-Carroll's broadband service is provided through a regular operating division of the cooperative, not a subsidiary.

launched with wireless-only technology, has been updated to include FTTP. The plan reflects the co-op's desire to "give our rural members a competitive edge." Providing high-speed Internet access is the cornerstone of the cooperative's pledge. Construction of JCE's new fiber-optic network is underway (see Figure 2).

Figure 2. JCE's fiber broadband network under construction. Photos courtesy of JCE.



Business Drivers of the Broadband Investment

The sole driver of JCE's broadband initiative was enhanced utility operations, in particular its implementation of advanced monitoring and control systems on its electric distribution system (the SCADA and AMI systems noted above). Both systems require a "carrier-class" communication infrastructure that provides high bandwidth (carrying capacity) and low latency (lag time in delivery of data packets from source points) with very high reliability. These operational requirements necessitate a broadband-technology solution within the cooperative's service footprint.

Members also need a better communication system. Fast, high quality access to the Internet is severely lacking in JCE's area, according to the co-op's president and CEO Mike Casper. Regional economic development initiatives have also been hampered by the lack of an advanced communication infrastructure. Casper estimates that as many as half of the co-op's members lack robust, high-speed Internet access. So, JCE's focus is to extend the fiber backbone where utility operations require and member needs exist.

Project Overview and Deployment Approach

Data backhaul from the AMI system JCE rolled out in 2010 and 2011 required a high-speed communications system. The co-op's initial communication infrastructure relied upon a fixed wireless network from 2009 until 2016.² However, management viewed wireless only as an interim solution, recognizing the need for higher speed as it enhanced its internal business operations. Management also questioned the life span of the

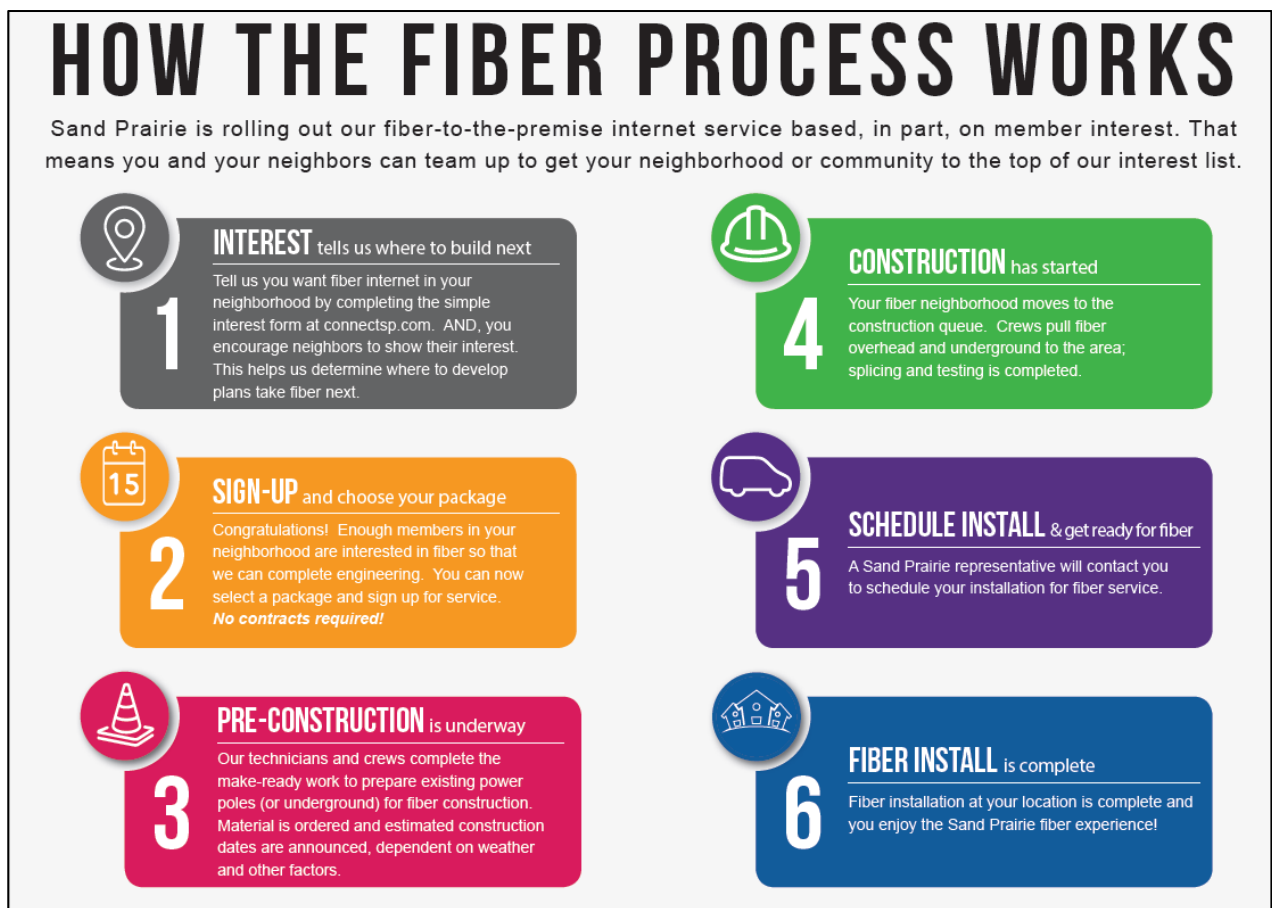
² The broadband division was initially called Sand Prairie Wireless.

wireless equipment and considered whether there could be diminishing economic returns over time with wireless technology.

In 2016, the cooperative completed a pilot project designed to test FTTP, with the particular objective of gaining construction experience and getting a handle on construction costs.³ Why the move to fiber? Casper says it has to do with fiber’s superior functionality and scalability, “No other product out there can compete with fiber — coax wired, wireless, even 5G (fifth generation cellular). Fiber backhaul has become critical for our internal operations.” He adds, “And for our broadband subscribers, it’s ultimately about the end-user experience.” JCE’s Director of Engineering Jesse Shekleton puts it more bluntly, “Fiber is fiber and everything else is not. Other forms of communication cannot match fiber’s bandwidth, speed, uptime, and latency.” As a practical necessity, JCE will maintain its existing wireless systems until the time when fiber networks can be extended into its current wireless coverage areas.

According to Shekleton, the way in which the network grows involves first looking at the deployment of intelligent, electronic devices across the electric and gas distribution systems and incorporating them into the network layout. Retail market analysts from the cooperative then identify areas where member interest in broadband service is high, clustering them into so-called “fiber communities.” Figure 3 indicates how Sand Prairie communicates to potential broadband subscribers to assess and localize levels of interest.

Figure 3. How Sand Prairie solicits subscriber interest and builds out its network.



³ Jo-Carroll strategically selected a pilot area with almost equal shares of overhead and underground lines to help understand cost and build-times in practical terms before a larger scale deployment effort could be undertaken.

A weighting and ranking approach that incorporates both operational needs and members' expressions of interest in retail broadband service ultimately determines build-out priorities. More specifically, member interest is grouped into what JCE calls "polygon" areas. These geometric, fiber-coverage areas are designed by the broadband team after taking into consideration existing utility infrastructure and analyzing overhead vs. underground, e.g., determining whether existing ducts/conduit will work. Sand Prairie's fiber communities are identified through a form of "crowd-sourcing." In areas that have a high cost to serve more members need to sign up for the fiber network to be extended there.

Once fiber is extended into a community (construction progress can be tracked on the cooperative's web site), several speed options are available—25Mbps x 5 Mbps (upload/download speed); 100 Mbps x 10 Mbps; and 250 Mbps x 25 Mbps, with prices starting at \$52.99 per month (see below for a real-life example of how this works).⁴

How Sand Prairie Grows Its Broadband Service Network—an Example

Member interest is one factor the cooperative uses to help determine future build-outs for the service. It is the first step in a six-step process on the road to fiber Internet. "We were very happy that Elizabeth residents responded so positively to the opportunity for fiber because the benefits are enormous," said Elizabeth village president Mike Dittmar. "Not only does it increase the quality of life for our residents, it is also a huge benefit to our businesses and continued economic development."

Sand Prairie currently has identified 13 fiber communities. Once enough interest is shown for a community, neighborhoods are mapped, and the sign-up phase begins. Elizabeth is now in that second step and once the necessary number of subscribers is reached it will move to the construction and installation phases.

"Assuming all members who were initially interested sign up, we are prepared to immediately mobilize crews and begin construction," said Shekleton. "The result will be the ultimate internet service available – and as an added bonus – is provided by their very own local, not-for-profit cooperative."

Elizabeth residents interested in the service are encouraged to visit the website to sign up for service. Members who had visited connectSP.com to indicate interest in have received sign up information via email.

Members in other areas also can express their interest and track progress on the Fiber Communities page. Active sign up areas are identified as orange on the Fiber Communities map. Announcements of new areas opening to sign up will be made on both connectSP.com and Jo-Carroll's website as well as the cooperative's social media.

"We are eager to see this project continue toward completion and begin the next fiber build out to another member community," Shekleton said.

Released by Sand Prairie – 1/23/2018

⁴ Currently, Jo-Carroll's network electronics can provide 1 Gigabit service. As of the time of this case study, Jo-Carroll is finalizing plans to offer a 1Gbps basic service package. Offer prices can be found at: <http://www.connectsp.com/fiber>

Broadband Business Case

Broadband access was centrally featured in JCE's 2008 business plan. Projected take-rates for the cooperative's broadband offerings have been periodically updated and the fourth iteration introduced fiber technology. The capital cost of the fiber broadband network, when fully deployed, is expected to be \$85 million with projected annual operating costs of \$3.5 million. Broadband subscriber revenues as of 2017 were \$964,000 and growing (currently 95 percent wireless and 5 percent fiber, trending to fiber). Extension of the fiber network into new fiber communities is generally contingent upon a discounted payback period of ten years or better.

In JCE's case, it is difficult to fully quantify the business case, as many of the key benefits of the communications infrastructure are related to internal business operations and cannot be easily monetized. JCE expects the next generation of AMI to incorporate a fiber backhaul and provide the platform to expand cooperative-to-member communications well beyond metering information and encompass smart grid, smart home, distributed energy resources, Internet of Things (IoT), etc. The main-line fiber backbone is driven by operational needs and with associated costs recoverable in electric service rates,⁵ while the costs of broadband retail drops are covered by subscribers' monthly fees. Casper reports that the current broadband model is 100 percent self-funded by Jo-Carroll – which, considering the expected full deployment cost, necessitates finding grant funding opportunities.

Broadband Business Model

The cooperative's fiber business follows a deliberate six-step process to reach into the communities served, and secure the necessary take-rates through signups to selectively extend its fiber broadband network as described earlier. The sales platform on the cooperative's web site is enabled in part by its partnership with Adams Telephone Cooperative.⁶

The advantages of JCE's business model are several:

- The joint needs of the electric and natural gas divisions and the retail broadband division are handled effectively and costs are allocated appropriately to avoid cross-subsidization.
- The infrastructure investment for providing retail broadband services is self-funded through broadband revenues.
- Investment risk is kept low and capital additions are carefully managed in a way that insures predictable, follow-on revenues to cover costs.⁷
- Partnering with Adams Telephone Cooperative takes advantage of an existing sales platform that minimizes risk and facilitates growth in broadband subscriptions.

⁵ Additionally, JCE internally bills the broadband division for costs of utilizing its mainline fiber system for retail broadband drops.

⁶ Adams Telephone Cooperative, which operates in southern Illinois, also solicits community interest through crowd sourcing.

⁷ While not actively recruited, broadband subscribers outside the co-op's legacy electric and natural gas service territory help Sand Prairie cover its wireless system costs and contribute to its ROI.

The cooperative is not currently investing in systems to provide ‘double’ or ‘triple’ play packages (service bundles of Internet, telephone and TV). Sand Prairie simply provides the most robust broadband connection available and allows members to have choice of “over the top” (OTT) products.⁸ The cooperative is working on marketing materials to assist members who are unfamiliar with OTT products. As is the case with other cooperatives being profiled in this series, Sand Prairie expects the video industry to migrate almost entirely to an OTT platform over time.

Network Architecture

In JCE’s case, the fiber backbone and “middle mile” fiber is one and the same. Everything except the broadband service drops to homes and businesses are considered to be part of the network backbone. Jo-Carroll has selected the All Di-electric Self Supporting (ADSS) fiber product for most applications, due to ease of installation and minimal amount of make-ready work required as the cooperative underbuilds a distribution system that is, like most electric cooperatives, predominantly overhead. Additionally, the original wireless system includes several towers with licensed frequency backhauls spanning 271 miles of Point-to-Point links connecting 100 access points to serve 1,800 wireless subscribers. As previously mentioned, this system is considered interim and will essentially be maintained and ultimately retired as the fiber system overbuilds existing wireless areas.

Network Ownership and Operations

JCE owns the fiber broadband network end-to-end and maintains a clear distinction between utility operations and retail broadband services to avoid cross-subsidies. Network operations are a shared responsibility between JCE’s three core business units of electric, natural gas and broadband. All three business units are subject to a ‘pro-rata’ share of administrative services, such as billing and mapping. This allows the cooperative to fully capitalize on existing staff and operating systems. Only services specific to the business unit, such as Tier I technical call center support, are exclusively part of the respective business units’ operating costs. Additionally, 44 miles of JCE’s backbone fiber connects the cooperative’s main office to one of two outpost offices and to a remote disaster recovery building housing redundant IT equipment to support business continuity.

Regulatory Issues

As a member-owned electric cooperative, JCE is not generally subject to utility regulation under the Illinois Commerce Commission. However, as Casper emphasizes, “One of our biggest challenges is to ensure that our ultimate regulators — our members — are not unfairly subsidizing others across our various lines of business.” Casper and his management team advise other cooperatives to perform due diligence to fully understand and address easement criteria specific to each co-op’s service area, and that issues may vary from cooperative to cooperative. Lastly, JCE is very active with regional political leaders in promoting the cooperative model and commenting on improvements to funding rural broadband initiatives.⁹

⁸ OTT is, according to Wikipedia, “a media distribution practice that allows a streaming content provider to sell audio, video, and other media services directly to the consumer over the Internet via streaming media as a standalone product, bypassing telecommunications, cable or broadcast television service providers that traditionally act as a controller or distributor of such content.”

⁹ At the time of this case study, JCE is working to submit two USDA Community Connect Grant applications.

In June 2017, Chris Allendorf, JCE’s vice president of external affairs and general counsel, testified about rural broadband before a U.S. House Subcommittee on Agriculture, Energy and Trade in Washington, D.C. In his testimony and in meetings with the offices of four Illinois representatives, he emphasized the impact of rural broadband and how critical a technology like fiber is to leveling the playing field for rural small businesses and farms, allowing them to compete in a global economy and, in doing so, provide economic development for rural areas. JCE believes additional improvements to funding are still needed to help accelerate the timeline and maximize the extent of rural broadband deployment. A fact sheet published by NRECA in March 2018 highlights some of the needed changes.¹⁰

Market Setting

JCE has built a comprehensive understanding of other telecom service providers and their offerings within its service area, including Internet access speeds, promotional pricing offers and contract lengths, price-after-contract-expiration, data caps, installation cost, and other hidden costs. These service providers range from independent Wireless Internet Service Providers (WISPs) to large, price-cap carriers providing twisted-pair copper and coax cable systems. The wireless providers are challenged with sporadic coverage areas and bandwidth speeds as well as intermittent uptime issues. The wired providers must market ‘up to’ speeds as they are prone to slower speeds during the typical ‘rush hours’ of 7-11 p.m. FTTP, on the other hand, provides a product that is unmatched and virtually future-proof in terms of scalability to meet future market demands, in JCE’s view. The cooperative sees its own market position as uniquely defined — the Sand Prairie broadband division operates as a “fiber cooperative.” According to Shekleton, this message resonates well with members who want fiber and they are reminded they already own a fiber-building resource (their local cooperative). The cooperative also offers its broadband service on a no-contract basis, which speaks to the confidence in the ultimate end-user experience it will provide and further differentiates Sand Prairie from other providers.

Challenges and Surprises

Unwanted surprises have been few and far between. Two key elements of JCE’s approach to deploying broadband have contributed to this:

- The co-op’s “pay-as-you-go” approach, relying on crowd-sourcing to determine the level of interest community by community, virtually eliminates uncertainty in forecasted take-rates. Sand Prairie secures the necessary take-rates during sign-up to move forward with construction.
- A highly developed marketing & communications plan demystifies every aspect of the process for members. Moreover, customers are kept continuously informed about progress in extending fiber into their communities.

¹⁰ <https://www.cooperative.com/programs-services/government-relations/Documents/Legislative%20Issues/Rural%20Broadband%20Funding%20Proposal.pdf>

Why is this Case Important?

JCE and its Sand Prairie broadband division reflect a business model that may have broad applicability to other electric cooperatives.¹¹ The model recognizes that broadband communication technology has become critical to internal utility operations as the electric grid becomes fully enabled with intelligent, electronic devices. From this operational starting point, JCE leverages its communications infrastructure to serve members in a carefully measured way. The approach JCE has adopted minimizes financial risks, avoids cross-subsidies between electric, gas, and broadband business units and enables regional economic development initiatives. The experience demonstrates that, when following a carefully laid-out approach, an electric cooperative is well situated to meeting the challenge of providing members in underserved areas with affordable, high-speed Internet access. As stated by Jo-Carroll's Director of Engineering, Jess Shekleton, "Sand Prairie as a local cooperative remains committed to its members' quality of life by working together to achieve ultimate rural prosperity."

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¹¹ Cooperatives are encouraged to work with local counsel to determine whether state law permits an electric cooperative to engage directly in non-electric business activities.