Broadband and Electric Cooperatives: A New Necessity

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Broadband availability in rural areas

Today, consumers desire access to information via smartphones, tablets, and computers with the click of a button. In urban areas, this instant access to information over high-speed Internet is readily available, and often taken for granted. In rural areas, however, many residents and businesses are being left behind, either unable to instantly access resources on the Internet, or, in some cases, no Internet access at all. The FCC estimates that 18 million Americans live without what it considers a minimal level of broadband: 4 megabits per second downstream and 1 megabit per second upstream (4/1). Making matters worse, most consumers don’t consider 4/1 adequate today – let alone in the increasingly all-video world of the future.

In its 2010 National Broadband Plan, the FCC set two goals: By 2020 everyone in the US should have access to 4/1 and 100 million homes should have access to 100 megabits per second downstream and 50 megabits per second upstream (100/50). Market forces were left to address bringing 100/50 to urban areas, while the FCC focused its Universal Service Funds on bringing 4/1 to rural areas.

By acknowledging that consumer demand by 2020 will require 100/50, the FCC created the perception among rural communities that the broadband gap between urban and rural areas is reality – and likely to get worse.
Broadband and economic development

Broadband has become a fundamental consumer need. Just like electricity 100 years ago, broadband is a new necessity. Inadequate broadband is threatening the economic future of rural communities. Rural areas that lack broadband are unable to attract or retain businesses. Young people don’t want to live in communities without jobs and adequate broadband. Together, these issues become a self reinforcing spiral. Low broadband connectivity affects both rural businesses and residences, impacting the economic viability of rural communities and the electric cooperatives that serve them.

The 2009 American Recovery and Reinvestment Act (ARRA) recognized this economic reality by investing billions of dollars in rural broadband projects. The vast majority of these projects were awarded for deploying fiber-to-the-home (FTTH) technology. But the ARRA projects covered only a small portion of the unmet need in rural America. The ARRA did make a small difference, but the broadband gap in rural areas remains with a some areas enjoying excellent broadband access over high speed fiber optic lines, and the majority left with decades old copper loops unable to support high speed broadband services.

Why fiber?

Broadband comes in many flavors: fiber to the home (FTTH), digital subscriber line (DSL), coaxial cable and wireless. Telephone companies and cable operators offer DSL and cable based services because these technologies leverage their existing infrastructure. But for new builds in rural areas there are only two viable options: An all-fiber network and a hybrid fiber-wireless network.

Wireless networks can be a good solution for remote, low-density areas and their ability to offer mobility is a huge value. Wireless can achieve the 4/1 goals set by the FCC, but wireless is unable to support, at reasonable cost, the higher bandwidths consumers increasingly demand for video services, such as YouTube, Netflix, and Hulu. As bandwidth requirements grow, wireless networks must be repeatedly upgraded and cell sizes shrunk to handle higher bandwidths and more subscribers.

The initial build out of an FTTH network is the most expensive part of the process. Thereafter, the cost to add incremental bandwidth to meet consumer demand is extremely low and ongoing operational costs are also low. As a result, once the initial fiber deployment cost is recouped, fiber
networks generate significant positive cash flow and scale at minimum cost to meet consumer demand.

The biggest initial costs are for fiber cable, securing right-of-ways, and hanging or burying the fiber. These cost factors provide electric cooperatives with unique advantages when it comes to fiber deployments. Electric cooperatives utilize mostly aerial plant and already own their own poles and right-of-ways. They also have extensive experience in building outside plant infrastructure, including fiber. In many cases, deploying fiber in rural areas is actually cheaper than building in urban areas, where right-of-ways are costly and streets may need to be dug up.

Fiber offers not only high bandwidth, but also high reliability. This is why fiber is demanded by businesses and anchor institutions. A critical element to any rural broadband business plan is to serve not only residences, but schools, libraries, hospitals, retailers and other businesses in the area. This fiber infrastructure is what allows businesses to be able to locate and expand in rural communities. Ask any national retailer or data center planner what are the key elements to citing a location, and they will say energy costs and fiber infrastructure.

The Internet has made it possible to locate jobs and data centers in rural areas, far from the population centers driving the revenues. But to successfully compete for these businesses, the community must provide the fiber infrastructure and energy resources they need.

**Why should electric cooperatives consider FTTH?**

FTTH and electric cooperatives are an ideal combination. FTTH enables an electric cooperative to provide a state-of-the-art communications infrastructure to all of its members. The same infrastructure also provides a foundation for economic development by serving businesses and anchor institutions. FTTH becomes a self reinforcing cycle where high broadband speeds help create jobs, which leads to more people living in the area and more members and businesses using electricity is good business for the cooperative.

FTTH enables electric cooperatives to generate new revenues through the offering of broadband services. Typically in rural areas, over half of the residents sign up for FTTH based services, with monthly service revenues often exceeding $100 per household if high speed Internet, voice and video services are offered.

FTTH can also be used to lower the operations costs of electric cooperatives through the implementation of advanced meter reading (AMR), load management, and rapid identification of
homes with power outages. This advanced two-way communications network extends not only to each substation, but to the power meter at each home. As technologies for grid modernization take hold, this two-way communications network will become an increasingly valuable tool, ultimately extending into the home.

Although grid modernization can also be achieved via wireless telemetry systems or power line carrier at lower costs, these solutions do not add to revenues, nor do they fuel the potential economic and social development of the community. Electric cooperatives should look at the deployment of FTTH as an initiative that pays for itself through broadband service revenues, while at the same time providing a two-way communications network for grid modernization that comes essentially for free, as an application riding over the broadband network.

The positive impact of FTTH for electric cooperatives goes well beyond a static business case. By rolling out FTTH, the electric cooperative is investing in the continued viability of its community. By making it possible for businesses to take root in the community and expand, and by enabling consumers to work from home and create home-based businesses. FTTH is a powerful vehicle for community development and economic sustainability.

**What are the FTTH technologies used?**

FTTH networks are easy to design and simple to operate. Because light can travel long distances through fiber and does not degrade with distance, FTTH networks suffer none of the design problems faced by DSL and cable networks. This makes FTTH ideal for rural areas in general and easy to work with for technicians doing communication services for the first time.

Typically, an FTTH network consists of an Optical Line Terminal (OLT), which is a switch located at the electric cooperatives facility, such as a substation. Between this location and the home or business there are no other active electronics, just fiber cable and other non-powered equipment for managing and splitting the light. At the premises, a small Optical Network Terminal (ONT) is mounted outside or inside the home or business that converts the light to service interfaces, such as Ethernet for high speed Internet, twisted pair for telephone service, and RF for cable TV.

The ONT also includes an Ethernet interface that can attach to an Ethernet enabled smart meter. A 12 volt UPS powers the ONT. This UPS is typically located inside and provides over 8 hours of battery back-up in the case of a power outage. This UPS can be powered from the home through a...
meter collar placed at the house or by plugging the UPS into an AC outlet inside the home. Because light signals are immune to electromagnetic interference, fiber cable can be located alongside existing electrical lines and drops to the home.

FTTH technologies come in two standards. Those that use the ability of light to be split are called Passive Optical Networks (PON), and those that do direct feeds without spitting are referred to as point-to-point (P2P). Both of these technologies are now capable of speeds of one gigabit per second. The most widely deployed PON standard in North America is called Gigabit Passive Optical Network (GPON), and the most widely deployed direct feed standard is called Point-to-Point GE.

Today, these two standards account for over 90% of the FTTH deployments in North America.

**How much will it cost?**

Building a fiber network consists of the outside plant fiber infrastructure and electronics in the serving office and at the home. The cost depends on a number of variables, but the two most important are subscriber density per route mile and the percentage of households that take the service. The outside plant part of the cost equation is one electric cooperatives are used to, but unlike power, not all households will take the broadband service.

The Fiber to the Home Council, an industry advocacy group, worked with a number of Calix customers to develop a model for estimating the cost of deploying FTTH. This model provided a simple formula, based on housing density, to estimate the cost of building outside plant in a rural, aerial deployment. This formula can be used for rough calculations and business modeling, but engineering consultants can provide detailed cost estimates based on the specifics of the geography. Typically measured as a “cost per home passed,” deployment costs can vary from $700 to $5,000 per home depending on housing density.

In a given project area, all homes will be passed, but not all homes will take the service. To estimate the “cost per home served,” the incremental cost to provide service to each home multiplied by the “take rate,” must be added to the cost to pass all the homes. A good rule of thumb is that the incremental cost to serve a home is around $650. This includes all electronics and the cost for installing the drop to the home.

Rural service providers have enjoyed very high take rates for their services when they deploy FTTH. Nationwide, the average rural FTTH system has achieved a 52% take rate, but in many
unserved and underserved areas the take rate is over 70%. Co-Mo Electric Cooperative in Missouri did extensive consumer surveys and determined before building their network that take rates would be very high and could sustain building the network. 72% of respondents said they were likely or very likely to sign up for the service. In their initial pilot project 41% of households signed up prior to construction, far exceeding their business plan.

How do you get started?

Calix is the leading vendor of FTTH electronics in North America. We have over 700 different customers deploying FTTH, primarily in the rural United States and Canada. We have over ten years of experience in helping customers deploy FTTH systems and thousands of new subscribers are turned up every week.

As part of our service to customers, we have created a consulting engineering program with a dedicated resource that works closely with professional firms with years of experience planning, designing and cost estimating FTTH build-outs. Calix can provide you basic information and point you to critical resources, but when it comes to detailed planning, design and implementation of the network these professionals are critical to your success. All of these firms have experience working with Calix FTTH electronics, as well as other vendors that make up a broadband service ecosystem.

Calix will work with you to make sure you get connected to the right people so that you have a basis for a reasoned business decision.

Now is a good time to consider rural broadband

As part of its implementation of The National Broadband Plan, the FCC proposed changes in the way rural telecommunications services are subsidized. These changes to the Universal Service Fund (USF) mean that the fund will shift from a voice support-only subsidy to a broadband incentive fund. In addition, the FCC has established a timeline for rural communications service providers to submit plans for how they intend to bring broadband to their service areas. For large service providers, such as ATT and Verizon, these service plans are “all in” and must account for entire states. If the plans of these incumbent operators do not provide for 4/1 service to the entire state, the subsidies for the unserved areas will become available to other operators starting in 2013.
This provides a set time period during which electric cooperatives can evaluate entering broadband through partnerships with local providers or alternatively entering broadband as a standalone business, possibly with the help of ongoing operating subsidies from the Connect America Fund (CAF), as it replaces the USF fund. Over the next 18 months, many areas of the country will find out officially through required FCC filings what local residents already suspect – that their local telecom service providers are not willing to invest to serve the rural areas. This is an ideal time for electric cooperatives to be planning for a broadband future – a future that will likely become more urgent in 2013.

Summary

The historical precedent is clear. By electrifying rural America, electric cooperatives allowed rural areas to not only survive, but thrive through the 20th century. In this new century, rural America is once again under threat from changes in demographics and consumer demand. It’s ironic that at a time when broadband technology enables people to work from anywhere, rural areas are threatened again with not having the infrastructure to compete. Just as they did for rural electrification, electric cooperatives are the ideal candidates to step forward to wire rural America with broadband.

For more information, go to calix.com/powerofbroadband

About Calix:

A world leader in broadband access systems, and the # 1 U.S. FTTH vendor

Calix is a leading global provider of broadband communications access systems and software. The Calix Unified Access portfolio allows service providers to connect to their residential and business subscribers and deploy virtually any service over fiber- and copper-based networks.

Calix has more than 1000 customers, whose networks serve over 50 million subscriber lines. Seven hundred of these service providers use Calix fiber access solutions. In fact, Calix is the No. 1 U.S. equipment vendor for FTTH, with 72% of U.S. service providers offering FTTH (Broadband Communities magazine, October 2011). In community after community, Calix has proven it knows what makes fiber access successful.