

Broadband Case Study: Roanoke Electric Cooperative

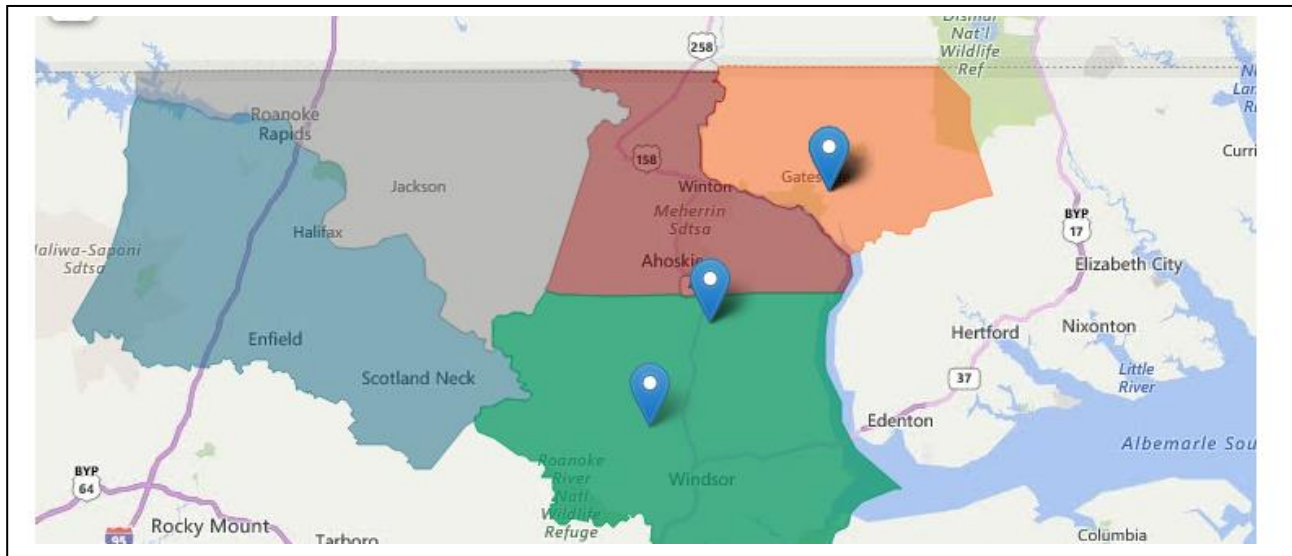
Cooperative Profile

Roanoke Electric Cooperative (REC) serves some 14,500 members across five counties in northeastern North Carolina (as shown in Figure 1 below), 95 percent of whom are residential. The cooperative maintains approximately 2,000 miles of distribution lines.



REC is intent upon building the smart grid infrastructure and deploying the robust, high-speed communication system necessary to operate the utility of the future. By May of 2015, REC had already connected its twelve substations to its offices, deploying 200 miles of fiber-optic lines as the first phase of a longer term plan to create a broadband network. The cooperative then began exploring the possibility of providing last-mile, broadband service to its members. Out of these dual and complementary visions of the future emerged “Roanoke Connect,” a new wholly-owned subsidiary focused on leveraging REC’s network backbone to deliver broadband access directly to underserved communities.

Figure 1. *Roanoke Electric Cooperative Service Territory*



Business Drivers of Broadband Investment

Nearly 60 percent of REC's total cost of service is in power supply. Management has targeted improvements in this area as part of its wholesale cost avoidance strategy. Consistent with this approach, REC is actively pursuing demand response, system automation, conservation voltage reduction, line-loss reduction, and energy efficiency programs as part of its long-term business strategy. As REC's CEO Curtis Wynn puts it, "Broadband communications are a critical part of realizing these wholesale cost saving opportunities. Distribution reliability and resiliency are equally important. Features such as proactive outage identification, which enables the co-op to respond before an outage is even reported by the affected member, and innovative member services such as online billing and new payment options, are not possible without a broadband communication infrastructure."

REC's Broadband Initiative

Primary objectives:

- Enhanced distribution reliability and resiliency.
- Lower cost through efficiency improvements.
- Higher member-owner satisfaction.
- Converging telecommunications with the utility business model.

Secondary objectives:

- New telecommunications service offering for consumers through the subsidiary business.
- New telecommunications revenue stream to the subsidiary business.
- Enhanced competition among incumbent telecom providers.

Prior to Roanoke Connect, REC's service territory had very limited broadband access, so limited in fact that only a small percentage of members targeted by REC for its Ecobee3 smart thermostat program could actually participate. Moreover, REC itself was relying on leased 56 kbps telephone lines to retrieve data from its AMI and SCADA systems. The fiber-optic network REC deployed to enhance its own operations became the foundation of a subsequent plan to roll out an all-encompassing, high-speed Internet service to homes and businesses around the communities REC serves.

Project Overview

The co-op's initial 2014 plan was to leverage its fiber backbone and establish an open access network, by creating a fiber ring and leasing dark fiber to Internet Service Providers (ISPs), cellular companies, and other telecom players. REC subsequently decided to explore the possibility of providing last-mile broadband services to members.

In July of 2016, the co-op issued a Request for Information (RFI) seeking a potential business partner to use its Phase 1 broadband infrastructure to anchor a communications network buildout that would serve 100 percent of the co-op's members. Although the RFI went to a host of ISPs, including wireless providers, minimal interest was received in response. As a result, REC decided to try developing the business concept and expanding the infrastructure on its own, aided by a consultant.

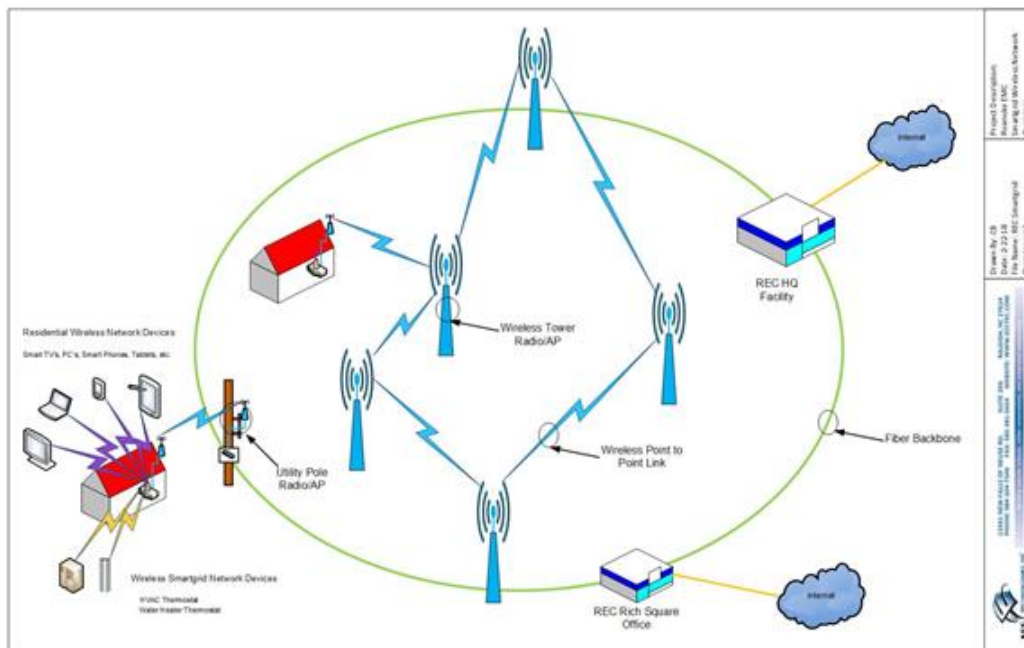
A pilot test involving 60 member-owners located near REC’s headquarters was undertaken in April 2017 to evaluate fixed wireless networking equipment and member acceptance/satisfaction. Participants received free, high-speed Internet access, water heater demand controls, and Ecobee3 smart thermostats. The results of the trial, combined with data from a Crowdfiber marketing program and member-owner meetings, indicated a strong demand for a service offered by the co-op. Currently, further trials are underway to aid in a technical assessment of additional capabilities for the network.

REC is committed to continuous evaluation of technology solutions as the network is being deployed. The value of offering members broadband service, while not the initial driver behind REC’s broadband investment, became apparent after the pilot test proved successful and highly popular. As a result, Roanoke Connect plans to fully deploy broadband service to enable edge-of-grid, demand-response devices (water heater controls and smart thermostats initially) within 24 to 48 months of its January 2018 launch date.

Network Architecture

REC’s broadband network relies on a hybrid architecture that combines both a fiber-optic backbone with fixed wireless technologies. Fiber laterals are extended from the backbone into areas containing higher population densities, whereas fixed wireless networking is deployed for the more rural middle-mile connections. Last-mile connections to member premises are wireless. Fixed wireless network components are integrated into the overall architecture as shown in Figure 2:

Figure 2. Roanoke Connect's Broadband Network Configuration



Fifty percent of the REC backbone is overhead versus underground. REC has chosen to locate the wireless access points below electric equipment on the poles. This provides several benefits to the project — it minimizes the necessity for electric line workers to become involved in installation and repair work, and helps avoid many of the wireless coverage issues created by high density tree canopies found in the REC service territory. This hybrid architecture positions REC to meet the current demands of its member-owners, while having a foundation in place which can easily be adapted and expanded for future needs.

Broadband Business Case

REC constructed a business case that values its demand response, system automation and broadband backbone investments, using data mostly provided by its power supplier NCEMC. Annual cash flow is positive for the demand response opportunities of smart thermostats and water heater controls, even when lost revenues due to lower kilowatt-hour usage are factored in. Signup for the co-op's Smart Energy Savings program enables members to avoid broadband installation and equipment charges, and receive small discount off the regular monthly broadband access charge for the first six months.¹

Figure 3. *New field tasks and network equipment at Roanoke Connect*



Roanoke Connect's projected take-rate is approximately 30 percent of members, which may be conservative given that as much as 70 percent of its member population — over 10,000 households — have no other viable broadband options. One Community Development Block Grant has so far been obtained and REC is actively exploring other potential funding sources to finance its expanded broadband infrastructure. Investment cost of the 200-mile, Phase 1 fiber-optic backbone was approximately \$4 million.

Broadband Business Structure

REC owns and operates the broadband backbone network and provides support related to the co-op's demand response and system automation programs. As such, related capital costs are rate-based as with other investments for system improvement. Roanoke Connect is a wholly owned, for-profit subsidiary of REC and is registered with the State of North Carolina as a Common Carrier.

National broadband consultant, ECC Technologies, was hired to assist in the development of the project strategy, developing and overseeing project implementation, and rollout of the network, as well as handling technical support of the last mile and middle-mile systems. ECC Technologies further supports REC's efforts by managing ultra-high capacity services such as dark fiber, wholesale lit services, and other last-mile services such as Gigabit to local businesses, each of which further leverages REC's broadband network

¹ See <https://www.roanokeelectric.com/content/smart-energy-savings>. Note, electric cooperatives interested in similar "bundle" offers should consult with an attorney regarding potential antitrust implications or other legal issues based on the co-op's specific circumstances.

assets. Overall, the business model is primarily that of a conventional electric utility whose distribution assets are being leveraged by advanced technology, namely high-speed telecommunications.

Regulatory Issues

REC has encountered few regulatory issues as it has built its broadband network, and has taken carefully measured steps to extend broadband access through its subsidiary Roanoke Connect. The cooperative views its broadband infrastructure investment as a critical enabler of its core utility programs to drive down wholesale electric costs and, thus, is treating those costs conventionally as a utility plant subject to rate recovery.

Market Setting

The broadband service market for households and businesses across REC's territory is currently limited. This limitation was reflected in the lack of interest on the part of ISPs and WISPs to the RFI issued by REC in mid-2016. According to REC, pre-existing telecom service in REC's service area is largely confined to CenturyLink for most telephone, and some Internet, services. Also according to the co-op, Spectrum serves some municipalities with TV and Internet services, but is generally limited to incorporated areas. Most TV service in the REC service territory is satellite-based.

Considering that all of the counties served by REC are deemed to be "distressed counties" by the state of North Carolina and have low population densities, it is unlikely that expansion of existing telecom services or upgrades to broadband speeds would have been viewed as an attractive business investment by incumbent service providers.

Challenges and Surprises

As can be imagined, there are a myriad of details in covering all of the required tasks needed to establish and operate a new telecommunications service that will be totally integrated into REC's existing business model. To meet these challenges, REC determined it was appropriate to form an internal working group of stakeholders for continual review of the project. From that group, three subgroups were formed with interlocking memberships, to ensure data reviews and decision making were pushed down for effectiveness and expediency. These groups focused on Marketing, Network and Technical, and Operationalization.

Future Direction

Several other community benefits have been identified as a result of the REC project. Discussions on rural telemedicine programs as well as educational programs supporting K-12 and higher learning are being explored. The rural nature of REC's community presents many challenges to its members to gain effective access to a number of programs which are widely available in more developed communities.

REC's network foundation will be used to bridge that gap.

Why is this Case Important?

In his 2016 Message from the CEO, Wynn encapsulated his vision for a future enabled by broadband communications:

“We take to heart the trust and confidence our member-owners place in us and are grateful for your support of our efforts to create a smart grid that will serve as the foundation for providing you the electric reliability and energy efficiencies you deserve. And we won’t stop there, because at Roanoke, it is our mission to go above and beyond providing you electricity. Our ultimate goal is to improve your quality of life, and we are proud to offer you the many services to usher us into a new era of becoming your utility of the future.”

Wynn’s message will resonate with many of his peers throughout the cooperative community. Moreover, REC’s path to meeting the complementary goals of enhanced distribution operations, improved quality of service and expanded, high-speed access to the Internet is worthy of close consideration. The cooperative’s investment in broadband communications is driven first and foremost by its core business operations — and management’s commitment to drive down wholesale power costs and stabilize member rates. This is a goal widely shared among electric cooperatives. Through Roanoke Connect, extending broadband service to communities who have few other options to connect meaningfully with the world beyond their local communities is icing on the cake.

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