Broadband At the peed of Light

How Three Communities Built Next-Generation Networks

Chattanooga, Tennessee

Bristol, Virginia

Lafayette, Louisiana

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Institute for Local Self-Reliance

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Recent ILSR Publications

Walmart's Greenwash
By Stacy Mitchell, March 2012

Rooftop Revolution: Changing Everything with Cost-Effective Local Solar
By John Farrell, March 2012

Learning from Burlington Telecom: Some Lessons for Community Networks
By Christopher Mitchell, August 2011

Democratizing the Electricity System - A Vision for the 21st Century Grid
By John Farrell, June 2011

Publicly Owned Broadband Networks: Averting the Looming Broadband Monopoly
By Christopher Mitchell, March 2011

Faster, Cheaper Broadband in North Carolina Comes from Community Fiber Networks
By Christopher Mitchell, November 2010

Breaking the Broadband Monopoly: How Communities Are Building the Networks They Need
By Christopher Mitchell, May 2010

Municipal Energy Financing: Lessons Learned
By John Farrell, May 2010

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Since 1974, the Institute for Local Self-Reliance (ILSR) has worked with citizen groups, governments and private businesses to extract the maximum value from local resources. A program of ILSR, the New Rules Project helps policy makers to design rules as if community matters.

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Foreword

The United States has made progress in recognizing that high-capacity broadband infrastructure is a critical and necessary component of a community's economic well-being and quality of life. Much still remains to be done, however, to turn this recognition into the reality of smart and connected communities across the nation.

Local governments everywhere want their communities to have affordable access to robust broadband infrastructure, just as local governments a century ago wanted their communities to have affordable access to reliable electric power. Then, with the private sector unable to electrify America everywhere at the same time, more than 3300 communities stepped forward to develop their own public power systems. Those that did generally survived and thrived, while many that waited for the private sector to get around to them did not.

Now, a growing number of communities believe that history is repeating itself in the broadband area, that if their businesses and residents are to succeed in an increasingly competitive information-based global economy, they must again take their futures into their own hands. Not surprisingly, as the private power companies did a century ago, several communications companies have sought to erect a wide range of legal, political, financial, and other barriers to the ability of communities to serve their own needs. This is true even in some rural areas that do not offer enough economic incentives for private investment. So, what should guide local governments as they navigate these highly complicated waters of high-capacity broadband?

This report details the experiences of three municipalities that have gained attention around the world for successfully designing and implementing public broadband networks – Bristol, Virginia; Lafayette, Louisiana; and Chattanooga, Tennessee. Each has faced significant challenges in its quests to bring 21st century communications technology and its benefits to its community. Each has met these challenges and is now providing its community multiple benefits that would not have been achievable any other way.

As we have learned from working with scores of community broadband projects across America, such projects can succeed in many communities, sometimes spectacularly so, but, depending on the circumstances, they may not fare as well in other communities. We believe that communities of all kinds can learn a great deal from the experiences of these three municipalities. In the past, reports by advocates of community broadband have tended to emphasize the substantial potential benefits of such projects, while reports by opponents have stressed the significant costs and risks involved. This report, written by the Institute for Local Self Reliance, provides an extraordinarily detailed discussion of both the pros and cons of such projects. In particular, it conveys especially well the need for well-informed and persistent local champions, careful and comprehensive planning, and the active engagement of community stakeholders—residents, business owners, educational and other institutions, and government officials.

We share the Benton Foundation's conviction that communications technologies must serve the public interest and that informed local choice is of paramount importance. It is within that spirit that we are pleased to join in the presentation of these case studies.

Jim Baller

The Baller Herbst Law Group

Joanne Hovis

National Association of Telecommunications Officers and Advisors (NATOA)

Executive Summary

Frustrated by ever-increasing prices for telecommunication services and the reluctance of incumbent providers to upgrade their networks to meet 21st century needs, more than 150 communities have built their own citywide cable and FTTH networks. Against great odds and in the face of ferocious opposition by the existing telephone and cable companies in the courts, at the legislature, and in the marketplace, the vast majority have succeeded.

To understand how this has occurred and to extract lessons that might be useful for cities deciding whether to build their own networks, we undertook an in-depth examination of three municipally owned networks in Bristol Va., Chattanooga, Tenn., and Lafayette, La.

Each of these communities already had access to the Internet via DSL and cable. But in the words of Lafayette City-Parish President Joey Durel, "They wanted more." Without investment in next-generation networks, these cities feared they would be left behind in the transition to the digital economy of the Internet era.

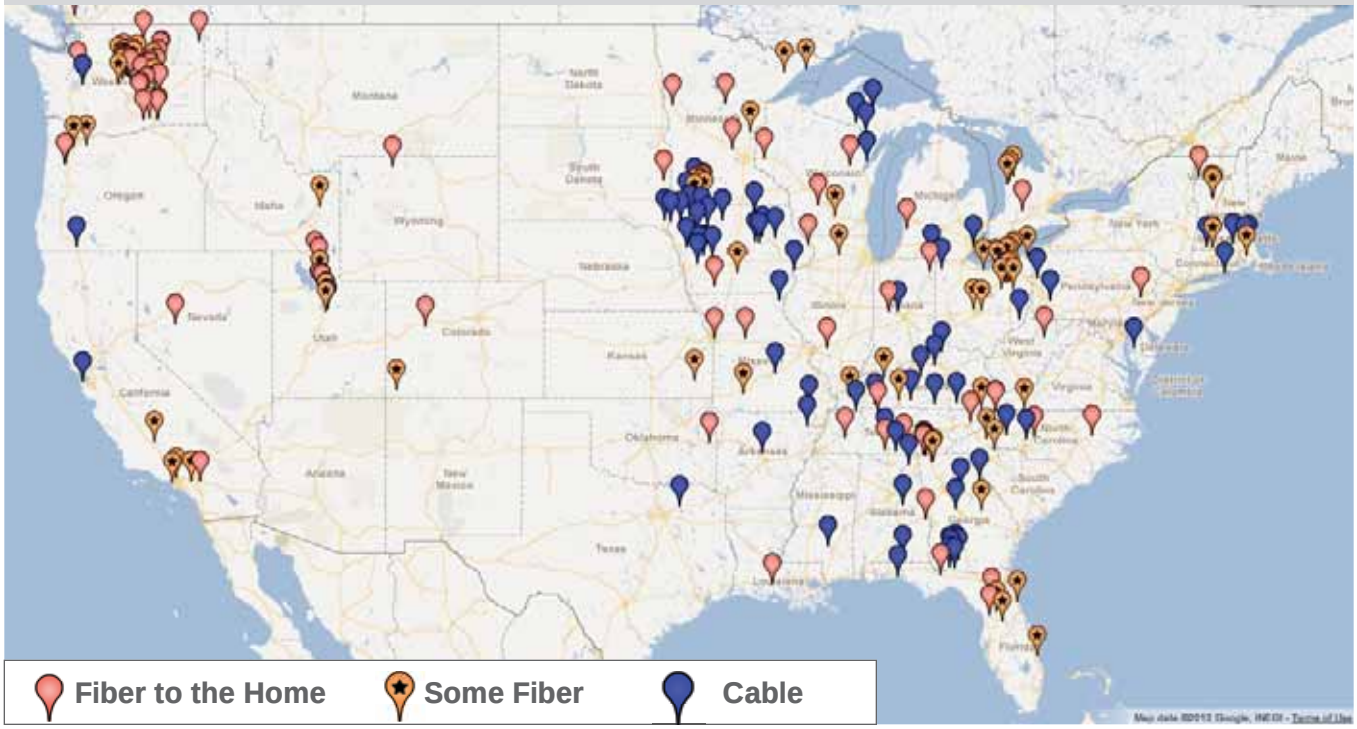
In each of these cases, the local public power utility took the lead in creating the new network—a characteristic of nearly every citywide publicly owned community fiber network in America. Each community had to navigate difficult seas, buffeted by lawsuits that dragged out construction schedules, state legislation that imposed additional burdens on public networks, and huge corporate competitors benefiting from a multitude of scale advantages. In each of these cases, the communities found their network to be a major economic development asset, generating or preserving hundreds of well paying jobs.

BVU Authority

Bristol was one of the first in the nation to build a citywide Fiber-To-The-Home (FTTH) network offering telephone, cable television, and broadband access to the Internet. OptiNet was launched in 2003 shortly after Bristol Virginia Utilities (later named BVU Authority) connected municipal buildings, electrical substations, and schools with its new fiber optic network.

Just securing and defending Bristol's right to build its own network cost $2.5 million and a few years of legal wrangling in the courts and legislatures. The struggle proved worthwhile as OptiNet has been fiercely popular from inception. When launched, signups

Publicly Owned Broadband Networks



Visit http://MuniNetworks.org/communitymap for the interactive version.

greatly exceeded expectations, creating unique challenges. The network now has a take rate of over 70 percent in Bristol and is continuing to expand in nearby counties.

To encourage economic development in Virginia's disadvantaged southwestern counties, OptiNet expanded outside Bristol to nearby businesses and industrial parks, leading to the creation of hundreds of high paying jobs. Local businesses have chosen to remain in Bristol rather than relocate due to the advantages of OptiNet.

One of OptiNet's principal goals was to achieve price stability for telecommunications services. It has succeeded admirably. OptiNet's telephone and broadband prices have remained unchanged since launched. Its cable rates have increased with rising input costs from the channel owners, but they remain below industry norms. A 2008 study found that OptiNet had resulted in almost $10 million of community savings since 2003. Self-provisioning, rather than leasing circuits, for the schools and local government saved $1 million alone.

OptiNet is running in the black and continues to innovate to serve nearly 12,000 subscribers. It recently rolled out new service packages, including a broadband tier offering downstream capacity at 1Gbps.

Lafayette, Louisiana

Lafayette, Louisiana is home to the longest-running, most acrimonious community broadband battle in the nation. City-Parish President Joey Durel, a Republican mayor in a conservative town and former Chair of the local Chamber of Commerce, became a celebrity for his biting quips and barbs responding to misinformation disseminated by Cox Cable and BellSouth.

As a businessman, Durel understood that Cox and BellSouth's drive to maximize profits would inhibit them from building a next-generation broadband network in Cajun Country. But as City-Parish President, he was infuriated at their extreme efforts to stop the community from building what was in its own best interest: a community fiber network owned and operated by the Lafayette Utility System connecting all the businesses and residents.

LUS was created by referendum in 1896 when local property owners voted to tax themselves to build a water system and electrical plant. Over the next hundred years, LUS persevered despite several privatization attempts. LUS estimates that over just the last 20 years the community saved $828 million in utility bills and tax reductions from owning its own electric utility.

When the LUS Fiber Plan was first floated in 2004, cable and telephone company lobbyists pushed for state legislation to ban municipal broadband networks. A compromise bill allowed LUS to proceed, although incumbents continued to file lawsuits and otherwise obstruct efforts to build the community network.

Although the law did not require it, Lafayette chose to hold a referendum to authorize the necessary bonding. It proved a wise decision after a fascinating and powerful grassroots movement coalesced in support of the community fiber network, partly as a reaction to tactics used by Cox, BellSouth, and other opponents to discourage the plan. The community overwhelmingly endorsed the network in 2005, authorizing LUS to issue $125 million in revenue bonds to build the network. A few years and several lawsuits later, LUS bonded for $110 million in 2007, began building the network in 2008, and started connecting customers in 2009.

The network has already led to hundreds of new jobs created by employers moving to Lafayette who were largely motivated by the network. For instance, when PixelMagic came to Lafayette as part of its work on the Hollywood movie Secretariat, the company found the LUS Fiber connections allowed them to affordably work remotely and they established a permanent presence in town.

Even before the LUS Fiber network connected a single customer, studies suggested that it saved the community millions of dollars by persuading Cox and BellSouth to hold off on several rate increases during the fiber fight in order to avoid negative publicity.

Today LUS Fiber offers one of the fastest basic tiers of Internet service in the country at an affordable rate: 10/10Mbps for $28.95. It has just announced a 1Gbps tier for $1,000 per month; prior to LUS Fiber, the cost of a gig circuit in Lafayette was at least $20,000 per month.

Chattanooga, Tennessee

Chattanooga achieved enduring fame by becoming the first community in the U.S. with universal access to a "gig." But EPB Fiber is not a one-hit-wonder, it is allowing the electric power board to build the most automated smart grid in the nation.

The community fiber network began slowly, starting in the 1990s with a goal of using a few fiber optic investments to control and monitor its electrical grid. In the early 2000s, EPB expanded the network and began offering telephone and broadband services to local businesses.

Despite a few lawsuits from Comcast and the state cable association, as well as 2,600 television ads aimed at scaring local citizens into opposing the project, EPB's plan to build a FTTH network across its entire electrical territory found widespread enthusiasm among the public and elected leaders.

The fiber optics system has proven to be a huge financial benefit to the electric side of the utility by allowing EPB to develop the most automated smart grid in the nation. Studies show that power outages cost the national economy approximately $80 billion each year. EPB resolved to cut the number and duration of outages on its network. An unprecedented scourge of tornadoes across the southeastern states in 2011 provided an early test of their approach. Though it was not even half built out, the network generated valuable savings from reduced truck rolls and fewer customer outages.

Whereas Bristol focused on lowering telecommunications prices, EPB Fiber Optics focused on providing higher capacity connections. Though its triple-play bundle is competitively priced in the market, the slowest tier of Internet access is 30Mbps symmetrical, a capacity that is nearly impossible to find at an affordable price anywhere in the United States. Chattanooga is most famous for its "gig," which is available to anyone it its territory for $349 per month. Though that may seem a high price, only a few U.S. communities have a gig service available even at ten times the price.

EPB's Electric division has already seen a $16.8 million benefit from the addition of telephone, cable television, and broadband services. Though Comcast and other opponents to the plan argued that selling telecommunications services would be a risk for electric ratepayers, EPB Fiber Optics has actually lowered the pressure on ratepayers.

The network has just announced its 35,000th customer and has seen thousands of new jobs created by employers that depend on the network. Nearby cities have even seen their employers expanding operations in Chattanooga simply because the cost differential for broadband is so significant.

Lessons Learned

What are the lessons other communities can learn from these three pioneers?

The most important lesson is that they can succeed, and in doing so create a powerful economic development engine. But that it won't be easy.

Bristol, Chattanooga, and Lafayette all overbuilt massive networks owned by huge corporations with tens of billions in revenues annually. In telecommunications, being very large is a tremendous asset for a number of reasons. One is a result of volume discounts on everything from physical equipment to television content.

A second is that Comcast, AT&T, Charter, CenturyLink, and Cox can spread their fixed costs across millions of subscribers whereas each community is spreading fixed costs across thousands or a few tens of thousands.

A third is that incumbent private providers will fiercely lobby the state legislature to enact legislation burdening public networks with additional regulations and just as fiercely campaign locally to persuade the community that local government involvement will cost taxpayers a great deal. That last argument tends to have the least resonance, however, in cities that own their own electric utilities because public power utilities almost invariably provide a highly reliable product at great prices and have a much better relationship with residents and businesses than cable and phone companies.

Publicly owned networks are burdened by additional rules not applied to their private competitors. For example, they must publish their budgets and generally operate transparently, sharing strategic information with private competitors who are not required to provide any comparable information. Private

companies can (and do) use profits made in non-competitive markets to subsidize rates in communities served by public networks, but public networks are usually prohibited from subsidizing the network using funds from other departments or increased taxes. Still another is that public networks like Chattanooga and Bristol cannot offer services outside of tight territorial boundaries even as their competitors can serve anyone in the state.

Another lesson learned from these communities is that the electric utility itself must undergo a structural and possibly cultural transformation for the new network to succeed. Electric utilities traditionally operate in a monopoly environment whereas the telecommunications networks will be in a highly entrepreneurial and innovative environment where they must fight for subscribers. This requires different management structures and possibly different personnel.

As these case studies show, the residents and businesses of these three communities can access some of the fastest most affordable connections in the nation. They are seeing local businesses expand and new businesses relocate to their city because of the new fiber network. Had they not acted, they would be in the same position as thousands of other communities, with a single DSL company offering slow connections and a single cable company offering moderately faster options.

While individuals can certainly survive without an Internet connection or electricity, it increasingly looks like communities without robust connections will have as much success as those without electricity.

Reports critical of community networks typically analyze them as though they were private companies: They only ask if the network is profitable. As this report shows, profitability is only a piece of the puzzle for a community network. Community networks are indeed expected to pay for themselves but BVU Authority, EPB, and LUS are not private companies. Their goals include encouraging economic development, increasing access to education, and improving quality of life. Many of the benefits of broadband networks, an essential infrastructure in the modern economy, are indirect, or spillover effects in economic terms. These benefits must be included in any proper analysis of community broadband.

The community networks in Bristol, Chattanooga, and Lafayette are either already successful or are on track to be successful by the narrow profitability measures of a private company. But when evaluated properly as a community investment, there is no doubt as to their overwhelming success.

In the wake of Verizon and AT&T ceasing expansion of FiOS and U-Verse respectively, communities that do not invest in their own next generation networks will likely not see any significant broadband investment in the near future. The question is not whether any or every community should build its own network but who should make that decision. Given the impressive results from Bristol, Chattanooga, and Lafayette, states should respect the conclusion from the Federal Communications Commission in its National Broadband Plan: **let communities decide for themselves.**

Introduction

As electricity lit up the nation at the end of the 19th century, private companies refused to build electric networks where they could not get a fast return on their investment. Rather than be left behind, some 3,300 local governments took matters into their own hands and built municipal electric networks to ensure everyone in the community had access to this new, increasingly important technology.

Today a similar dynamic is at work in the telecom sector. Fast, affordable, and reliable Internet access is essential infrastructure for 21st century communities. Without it, businesses wither, students are at a disadvantage, economies become less competitive, and home values decline. While individuals can certainly survive without an Internet connection, it increasingly looks like communities without robust connections will have as much success as those without electricity.

Unlike a century ago, when the majority of the country had no access to electricity, today almost everyone can access the Internet. But many communities are still in the dial-up age, and access in the vast majority of the country is at relatively low speeds and high prices. Most communities have no more than two providers—the cable company and the phone company. A handful of these companies serve tens of millions of subscribers nationwide. Lacking meaningful competition, many of the these massive corporations have regularly delayed upgrading to higher-capacity connections that are crucial in a world where visual information, as well as text and audio, is routinely sent and received via the Internet.

In response to the big corporations' recalcitrance, local governments are again taking charge of their futures and building their own broadband networks. The U.S. presently has about 150 citywide, publicly owned cable or next-generation fiber-to-the-home (FTTH) broadband networks. Most are owned by municipal electric agencies, many of which needed to connect their substations with high capacity broadband connections to manage their power delivery. Public power agencies already had a strong expertise in "outside plant" (i.e., working in the rights-of-way with poles, wires, and conduit) and managing relationships with customers. It was only natural for some of these agencies to invest in another essential infrastructure that the community otherwise may not have.

As public broadband has proven viable and competitive—just like public power did a century ago—private companies have fought back with lawsuits and direct involvement in local political campaigns, and by fiercely lobbying state legislatures to stop or severely hinder the expansion of public broadband. That so many cities have succeeded in the face of hostility by very powerful corporations is a testament to their perseverance and imagination.

In 2011, the Institute for Local Self-Reliance (ILSR) published a map identifying all existing publicly owned citywide broadband networks. That map provided the universe—the view from 50,000 feet. This report drills down to ground level, describing and analyzing the public networks in three cities: **Bristol, Va.**, **Chattanooga, Tenn.**, and **Lafayette, La**.

All three networks grew out of these cities' experience with public electric power. Bristol is a small city of 17,000 in southwestern Virginia on the border of Tennessee. It was one of the first to build a publicly owned citywide triple-play fiber-to-the-home network. Chattanooga and Lafayette are larger communities of 170,000 and 120,000, respectively. Lafayette, located in the heart of Cajun country, has had to endure longer legal battles and incumbent opposition than any other network, yet has built an impressive broadband system using an innovative approach that has already been copied by several other communities. The Electric Power Board (EPB) in Chattanooga owns and operates the nation's largest community fiber network—one that also offers the nation's fastest speeds, and is able to offer 1Gbps (1,000 Mbps) to anyone in the 600-square-mile territory.

This report begins with a description of the efforts of each city and is followed by an analysis of the lessons learned from their experiences.

BVU Authority

Introduction

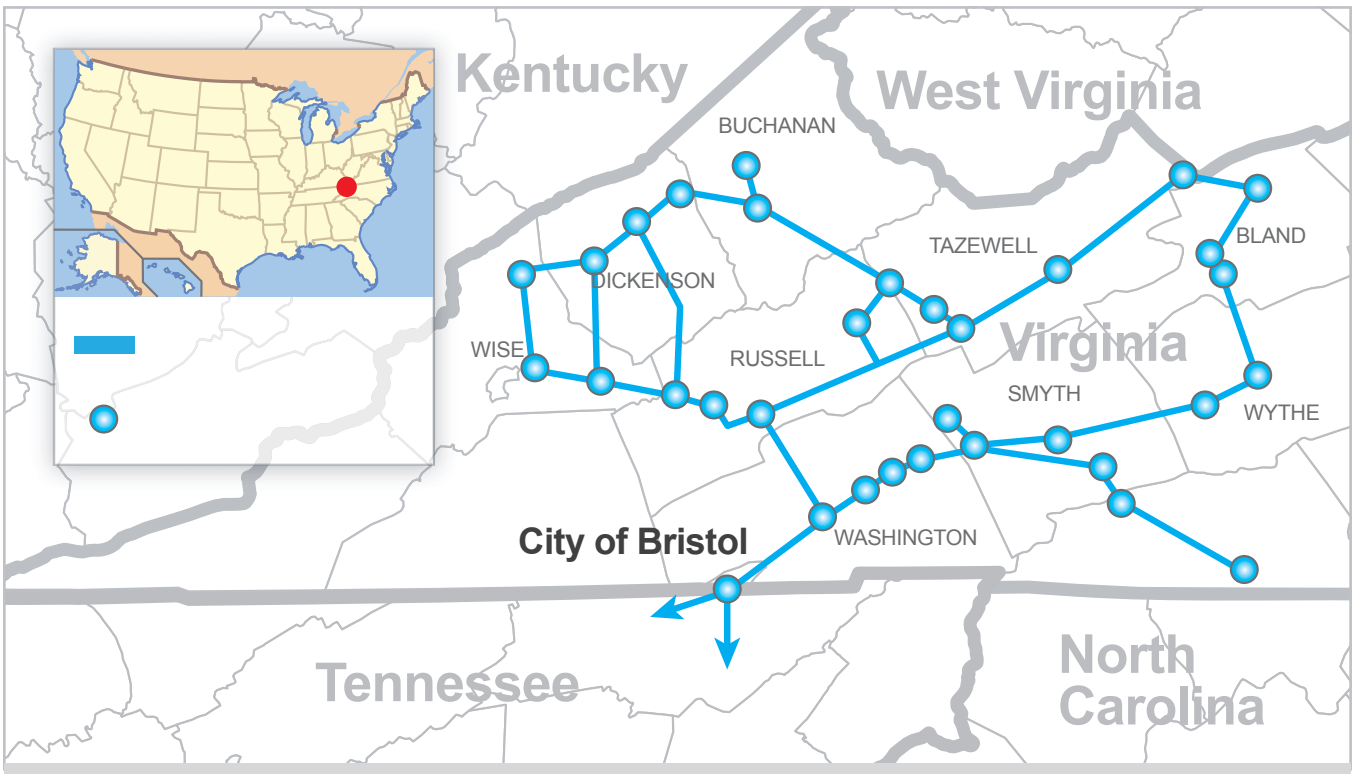
Bristol lies in the Appalachian Mountains, with one side of the community in southwestern Virginia and the other in northeast Tennessee. It is most widely known for its NASCAR Bristol Motor Speedway (seating for 160,000) and for claiming the title "Birthplace of Country Music." Unfortunately, the local economy was hard hit over the past 20 years by a number of declining industries, most notably tobacco and coal.

The Virginia side has approximately 17,000 residents, whereas the Tennessee side claims more than 26,000. The area population grew until 1980, and then declined until leveling off in 2000. This case study focuses on the Virginia side because Bristol Virginia Utilities built one of the nation's first municipally owned, triple-play FTTH networks—OptiNet. Bristol, Tennessee, later launched its own FTTH network, called Bristol Tennessee Essential Services.

Bristol, Virginia, has a council-manager form of government that oversees an annual budget of approximately $50 million. The community's median household income is below Virginia's average and it is ethnically more homogeneous than other parts of the state. Residents are generally older than state averages and more rooted in their community. Educational attainment among adults is below the state average, in part because residents could, for many years, find solid local employment with a high school education, or less. Today, the school system is highly rated and 75 percent of high school graduates continue their education.

When Bristol Virginia Utilities (BVU) began building its fiber optic network – OptiNet – in 2002, Sprint had 100 percent of local phone customers and offered DSL in some areas of the city. Charter Cable, one of the largest cable companies in the country, was the primary provider of pay television. In addition to these two incumbents, BVU eventually also competed against Comcast in some portions of nearby Washington County.

Approximately $80 million has been invested in the network to date. Of this, $58 million in bonds and internal funding has been focused on service in Bristol while $22 million in grants have financed expansion to businesses and industrial parks throughout south-western Virginia. OptiNet passes 35,711 businesses



Map of OptiNet in Southwestern Virginia

and residences as of February 2012, with 11,752 subscribers, including some 70 percent of premises within Bristol's Virginia limits. It employs the equivalent of 42 full-time workers.

The network has been lauded in publications from *The Economist* to the FCC's "National Broadband Plan for America." Both the National League of Cities and Virginia's Governor gave technology awards to Bristol for its network in 2008. In 2009, the National Association of Telecommunications Officers and Advisors (NATOA) named OptiNet the Community Broadband Fiber Network of the Year. The Intelligent Community Forum labeled Bristol among the top seven most intelligent communities in the world in 2009 and top 21 in 2010.

In 2010, motivated by a number of considerations including the ability to get lower-cost financing, Bristol Virginia Utilities separated from the City and became BVU Authority, an independent subdivision of the state.[1] It remains a public entity that has to operate transparently and abides by the Freedom of Information Act but no longer answers to Bristol's city council.

BVU Authority has long been an active and strong supporter of the FTTH Council, an association of providers promoting high capacity networks, and its mission to promote full fiber optic networks, particularly in rural areas. In fact, Kyle Hollifield, BVU Authority VP of Marketing and Business Development, is presently Chairman of the Board at the FTTH Council.

In resisting BVU's entry to the market and later claiming OptiNet was a failure, major cable and telephone companies refined the tactics they would use to discourage other communities from following Bristol's lead.

Getting Started

In 1999, following a severe storm that shut down the utility, BVU explored building a fiber optic ring that would connect its eight substations and provide supervisory control and data acquisition (SCADA) applications to increase grid reliability. When it discovered the low cost of additional capacity, BVU began planning for a network capable of offering up to 1Gbps (1,000 Mbps) to multiple locations within the city.[2] This plan was developed nearly 10 years before the FCC set a goal of having 100Mbps available to 100 million Americans by 2020.

BVU began connecting municipal buildings and schools to its fiber network in 2000. While most schools in the country were working with 1.5Mbps connections to the Internet, Bristol's schools were on a gigabit network (such connections are still uncommon for schools in 2012). Schools on slower connections tend to have more problems administering mandated tests or using instructional software.

A study later showed showed that the community had saved $1 million alone from self-provisioning telephone services from 2003-2008. BVU also improved the school's voicemail system and helped troubleshoot networking problems—assistance the schools had trouble finding elsewhere.

Fiber-to-the-home (FTTH) was relatively new when BVU began considering an expanded network. Kutztown, Pennsylvania had just launched its broadband and pay television FTTH network with a partner providing telephone services. Some Washington Public Utility Districts were experimenting with the technology but state law forced them to use a wholesale-only approach rather than provide services directly. BVU first expected to build an open network that would be used by other service providers. Upon analysis, it concluded that a wholesale-only model would not generate sufficient revenues to pay off its construction debt. BVU then looked for a partner that would be the exclusive provider of services through their advanced network. When the most likely candidate, telephone incumbent Sprint, was not interested, BVU concluded it would have to offer services directly; but before it could do so, it had to challenge a 1998 Virginia law prohibiting that approach:

> Notwithstanding any other provisions of law, general or special, no locality shall establish any department . . . or entity which has authority to offer telecommunications equipment, infrastructure . . . or services . . .[3]

BVU believed this law violated the 1996 Telecommunications Act, which explicitly aimed to reduce barriers for competition in telecom. Federal legislators had been quite clear in their desire to enable both private and public investments in advanced

telecommunications services (particularly after hearing compelling testimony from the pioneering and successful Glasgow municipal network in Kentucky). The federal Act's pertinent language is:

> No State or local statute or regulation, or other State or local legal requirement, may prohibit or have the effect of prohibiting the ability of any entity to provide any interstate or intrastate telecommunications service.[4]

In 2000, Bristol filed suit to have the statute rendered unenforceable. Confident its lawsuit would succeed, BVU commissioned independent analyses of its options even before the suit was decided. Surveys revealed that BVU had a very good name in the community and that most residents would be interested in taking broadband, phone, or cable services from it. The incumbents, Charter and Sprint, had poor reputations and neither had a business office in Bristol, Virginia.

BVU was more interested in keeping rates low and enhancing services than maximizing income. Its target was to charge 25 percent less than existing options for cable television and 20 percent less than existing options for Internet access. It forecast spending $15 million to build a network that could serve all 450 businesses and 9,800 households in its electric territory (i.e., all of Bristol and portions of Washington County) as well as half of the 1,575 potential business customers in nearby Abingdon. With these conservative assumptions, the business analyses concluded the utility needed to achieve a 30 percent to 35 percent take rate (percentage of subscribers in the areas served) to break even on its investment.

In addition to offering lower rates than the incumbents, BVU planned to offer much faster Internet access, a wider local toll-free calling area, and less costly voicemail and caller ID.

In May of 2001, the federal court decided the lawsuit in BVU's favor. BVU then worked with local legislators to pass SB 245 in the 2002 session of the Virginia Legislature, which allowed the utility to offer telecommunications services. Despite these victories, BVU had to file with the State Corporation Commission (SCC) to provide phone service. Sprint petitioned the SCC to block BVU until BVU could *prove* the electricity

BVU Authority Headquarters

division would not subsidize its telephone rates. Until the matter was resolved, the SCC required BVU to at least match Sprint's regulated rate.[5] Wanting to offer the best deal possible to residents and businesses, BVU opted not to charge its customers the "Subscriber Line Charge," an ancillary fee that Sprint did charge customers. The SLC is a fee, then $5.51/month, which the FCC allows telephone providers to charge at their discretion. Because BVU chose not to charge that fee, its monthly prices were $5.51 less than Sprint's.

The SCC proceeding was not officially resolved until early 2005, when BVU was found to be correctly allocating its costs. This was the last of the legal challenges to date, but the combination of delays and legal fees significantly burdened the fledgling system. By 2005, BVU had spent $2.5 million in unanticipated legal costs to exercise its authority to build its own triple-play FTTH network.

Unlike the state regulated phone rates, BVU had greater latitude in deciding its cable and broadband rates. In these cases, BVU staff would make recommendations to the BVU Board, which would send its final recommendations to the City Council for approval.

BVU planned to launch triple-play services (phone, cable television, and broadband) in late 2002 but again a lawsuit intervened. Charter challenged BVU's authority to offer cable television under the recently passed statute. By the end of the year, BVU was offering phone and broadband services—but not cable, pending the court decision.

The court ruled in favor of Charter in the cable case but Bristol went back to the Legislature and secured the necessary authority.[6] Finally, in July 2003, BVU began

Table 1: Telephone Rates in Bristol, 2003

Telephone rates	Residential	Business	Trunk
Sprint	$20.15	$41.11	$63.45
BVU	$14.64	$30.10	$54.35
Savings/ month	$5.51	$11.01	$9.10

offering its full suite of triple-play services over its FTTH network, called OptiNet. The 2003 law authorized BVU to provide cable services only in Bristol and nearby Abingdon, but the 2002 law allows it to offer phone and broadband services across the wider area that is within 75 miles of its electrical footprint (as it existed in on March 1, 2002).

Building the Network

In 2002, BVU built the network backbone (also called the "pass"), stringing fiber optic cables across town but not yet connecting subscribers, at a cost of $9.4 million. It forecast another $3.1 million for the necessary drops (i.e., the connections from customers' premises to the pass). Each Optical Network Terminal (ONT—the electronic device attached to the house that provides access to the network) ran $1,000—a cost that has declined considerably since. The electronics to run the network were forecast at $2 million. The cable "head end," a number of devices required to acquire and disseminate cable programming, cost $2.1 million. The head end had been already been built in 2002 before BVU had re-established its authority to offer cable services in 2003. BVU partnered with a nearby phone company to obtain switching services at a reasonable rate, but still needed to buy about $1 million in phone equipment to offer telephone services. Cars, computers, and other miscellaneous expenses totaled almost another $1 million.

To fund the network, BVU issued $27.5 million in revenue bonds in 2003, secured by the utility's assets.

OptiNet marketing focused on residential subscribers, mostly by leaving door hangers with information at their houses and following up with door-to-door sales people. The response far surpassed OptiNet's conservative projections. The network had 1,500 people on the waiting list before connecting the first subscriber. When it finally launched services, it averaged 20 to 30 calls a day, more than expected and far more than BVU received for its other utility services.

It was a challenge to hire and train enough employees to connect all those asking for service. At one point, the waiting list to get service was 16 weeks. It is a testimony to both the demand for the service and the goodwill toward BVU that people were willing to wait. Once OptiNet employees adjusted to the workload they managed to connect 50 percent of the 10,000 homes and businesses passed by the end of the first year. This greatly surpassed expectations, as the original forecast predicted a 45 percent take rate by year three.

Part of the reason for the remarkable level of subscribers was OptiNet's affordable price. As noted above, the State Corporation Commission required OptiNet to match Sprint's basic residential and business line rates, but OptiNet elected to keep its price lower by foregoing the optional subscriber line charge. At that time, Sprint was the telephone monopoly—no other providers offered phone services in town. If Sprint elected to cut its rates in Bristol, it

Table 2: Charter and OptiNet Cable Television Pricing, 2004

	Charter	OptiNet (2003)	OptiNet (after 2004 increase)	Savings before increase	Savings after increase
Expanded Basic	$41.00	$31.75	$36.75	$9.25	$4.25
Digital	$44.95	$43.50	$45.95	$1.45	-$1
Digital + 4 premium channels	$74.95	$61.95	$69.95	$13	$5

might have been pressured by state regulators to also reduce its rates in other, non-competitive communities. Along with its lower prices, OptiNet had the above mentioned enhanced services, and a much better reputation for customer service.

On the cable side, OptiNet also lacked some control over its pricing, although in this case the external influence worked to lower rather than raise prices. BVU was governed by the City Council, which had authority to change OptiNet's prices. When the utility proposed a price for basic service at 10 percent below Charter's price, the City Council voted to lower the price even further to emphasize the benefits of OptiNet.

Ten months later, OptiNet had to raise its cable prices. Even after the increase, OptiNet's rates were below that of competitors (see Table 2). Charter was offering expanded cable for $41/month (with a $29.99/month one-year promo offer for new subscribers)[7] while Bristol's monthly rate after the hike was $36.75. A newspaper article at the time noted, "OptiNet customers said it would take a big swing in prices to make them switch back to Charter."[8]

Charter responded by lowering its cable prices and raising its Internet access prices, but only for the Virginia side of town.[9] As a result, Virginia residents paid different prices for the same services as their Tennessee neighbors, located just a few blocks away. BVU did not expect more serious price competition from Charter, which had already raised the ire of the FCC by offering extreme discounts and cash bounties to undercut competition from publicly owned networks like the one in Scottsboro, Alabama. The FCC commented on Charter's behavior in its 2001 *Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming* (published in early 2002), and BVU believed this scolding would deter Charter from engaging in another highly visible campaign to undermine competition.

It would be another six years before BVU increased its cable prices again—a stunning length of time in this industry. OptiNet clearly succeeded in its goal of rate stabilization.

BVU feared incumbent providers would use their influence at the legislature to further disrupt their network plans and decided to expand the network as fast as possible. The accelerated schedule is one reason expenditures were higher than forecast. Other factors were legal fees, higher-than-expected subscriber demand (an extra 1,000 subscribers increased capital costs by more than $1 million alone), and the challenges of being among the first FTTH networks in the world. In year one, OptiNet was $4 million in the red despite projections that it would have been down $2.1 million. In the second year of operation, however, the deficit was $1 million less than projected. Due to the upfront capital-intense nature of FTTH networks, owners almost always run in the red for several years while building their customer base. To cover the shortfalls, BVU borrowed funds that were later repaid by OptiNet.

Growing the Network

Even before BVU finished connecting its first round of subscribers in Bristol, it had partnered with the Cumberland Plateau Company (CPC), the non-profit arm of the Cumberland Plateau Planning District Commission, to expand the fiber optic network to industrial and business subscribers in southwest Virginia outside Bristol (but within the area permitted by statute). With a mission to improve the infrastructure in the region, CPC covers the counties of Buchanan, Dickenson, Russell, and Tazewell.

The extension of the network was funded by the US Department of Commerce Economic Development Authority ($1.6 million) and a matching grant from the Virginia Tobacco Indemnification and Community Revitalization Commission ($1.55 million). This investment had a powerful and almost immediate economic impact, creating hundreds of jobs. Further grants in 2005 from the Department of Commerce, again matched by the Tobacco Commission, expanded OptiNet in the CPC region. When finished, the BVU and CPC partnership passed over 1800 potential commercial/industrial customers. Two new industrial parks would eventually be constructed and connected as well.

By the end of 2005, BVU had invested more than $43 million in the fiber optic network that was helping to transform southwestern Virginia. As the number of potential customers expanded, the take rate remained consistent. In the residential base, approximately 4,300 households subscribed to phone and cable (putting its

Cumberland Plateau Company Coverage Area

take rate over 50 percent) and 2,500 subscribed to broadband (30 percent). Among business passings, 450 took voice services (50 percent take rate), 375 took broadband data services (41 percent), and just over 150 took cable (few business and industrial customers needed television services).

In 2006, three professors published a case study about publicly owned broadband networks in which they noted OptiNet's large debt and anticipated a business failure:

> OptiNet does not seem to have much prospect. Future growth in subscription-based services is limited by its private-sector competitors, and OptiNet is not in a position to raise prices without losing a significant number of customers to its competitors. Finally, OptiNet is susceptible to a significant decline in its existing customer base if its competitors decide to compete more aggressively by lowering their prices or expanding their service offerings.[10]

They could not have been more wrong about OptiNet's ability to grow and prosper. However, the debt concerns were more complicated. As detailed above, the cost of building the network exceeded projections due to unforeseen legal costs defending challenges from incumbents and OptiNet's unexpectedly rapid subscriber growth. Too much debt would constrain its capacity to expand and connect nearby businesses that wanted OptiNet's services. But according to BVU Authority General Council Walt Bressler, the debt was not as large as others assumed.

OptiNet had booked $23.7 million from the Electric division as debt while the State Corporation Commission (SCC) was examining the cost allocation models for the network's telephone and cable television services to ensure neither was receiving any subsidization.[11] Once those models were accepted, BVU could show the $23.7 million was used to fund broadband services. Because those funds did not subsidize telephone or cable television, the utility could choose to treat it as an investment rather than a debt.

BVU Authority President and CEO Wes Rosenbalm explained the decision this way: "We viewed it, and our

board viewed it, as an investment in our community and the future of our region."[12] It is not unusual for electric utilities to invest in expanding economic development in their service area, in part to increase sales and if they are publicly owned, to serve their communities. BVU decision allowed OptiNet to continue its expansion into the underserved nearby communities.

By early 2007, OptiNet had grown significantly. It had 6,300 residential subscribers and 900 business subscribers, giving it a remarkable take rate of 65 percent across its footprint. As 2007 ended, BVU surpassed 8,000 subscribers. Its success attracted national and international visitors who wanted to understand the model. Responding to the mounting requests, BVU launched an official venture to help others run networks. FOCUS (or Finding Opportunities for Communities throughout the United States) would manage the network created in partnership with CPC and later also a cable network in North Carolina, MI-Connection.

Halfway through 2008, OptiNet rolled out video-on-demand, matching a feature touted by its competitors. By August, the network had more than 9,000 subscribers, including more than 1,200 businesses.

From Muni to Authority

On October 27, 2009, the Bristol City Council voted 3-2 to ask the Virginia General Assembly to allow BVU to transition from City ownership to an independent authority owned by the state. The State Legislature approved in early 2010 without opposition (Senate Bill 12, House Bill 27). Some citizens mounted a campaign to stop the separation, fearing the loss of public control over the utility providing essential infrastructure, but the campaign did not succeed. A lawsuit to stop the separation also failed.

Today, BVU Authority continues to operate as previously but the Bristol City Council no longer approves the decisions of the of the BVU Authority Board—which means the City Council has less control over BVU Authority's decisions. The eight-member BVU Authority Board is composed of three members appointed by the BVU Authority Board, four members appointed by the Bristol City Council, and one member of the Board of Supervisors for Washington County.[13] Each appointment is for four years and a member cannot serve more than two consecutive terms.

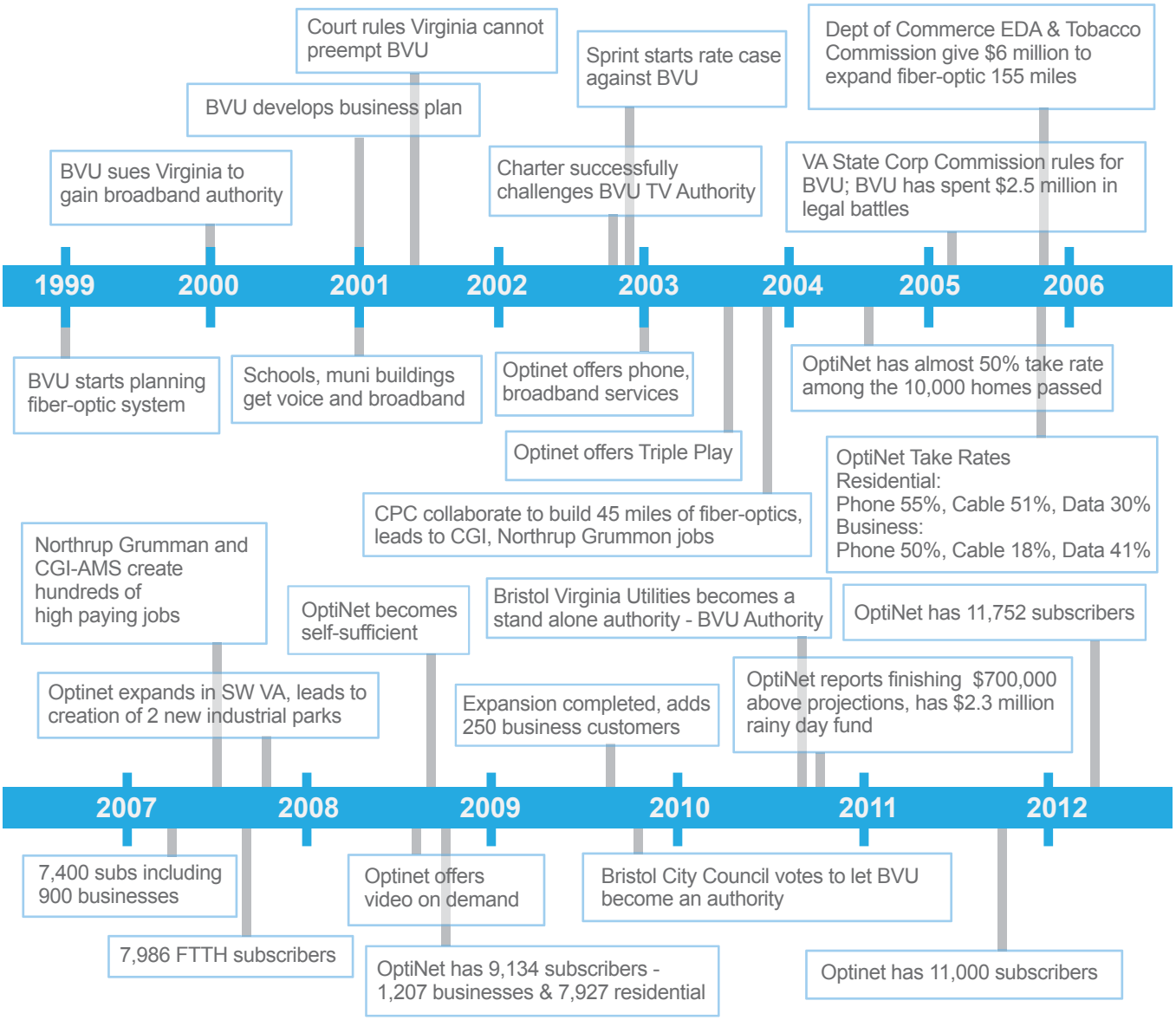
The main motivation for the transition is BVU Authority's ambition to continue expanding OptiNet to serve all of southwestern Virginia. The utility believes it will be better positioned to borrow the necessary funds for expansion as an authority than as a municipally owned utility. BVU Authority will continue contributing $500,000 annually toward the City's economic development. It will also continue making payments in lieu of taxes: $350,000 per year from the electric utility and starting July 2013, $100,000 per year from OptiNet (the sum will increase as OptiNet continues to expand).

After BVU Authority restructured, it refinanced bond debt totaling approximately $44 million.[14] Working through the Virginia Resource Authority, a state agency that bundles community bond offerings relating to infrastructure, and by taking advantage of the Buy America Bonds available through the stimulus package, BVU Authority lowered the interest rate on its debt from an average of 5 percent to 3.62 percent. The 25-year term revenue bonds are expected to result in savings of $720,000 to $750,000 per year compared to the status quo.

Recent Events

With steady subscriber growth, the network broke even in fiscal year 2008 with net income of almost $425,000.[15] The following year, OptiNet finished $700,000 above projections and today has built a $2.3 million rainy day fund, a restricted cash reserve that provides 245 days of cash on hand. Additional Tobacco Commission grants in 2009 and a broadband stimulus award in 2010 have allowed further expansion across rural southwestern Virginia, but OptiNet still has to remain within 75 miles of its territory as defined in 2002.

The broadband stimulus award came from the second round of the American Recovery and Reinvestment Act's Broadband Technology Opportunities Program (BTOP). The stimulus award provides a grant of $22.7 million toward a $37.3 million middle mile project that will bring fiber optic cables "close to 122 anchor institutions and within two miles of more than 18,000 households and businesses."[16] OptiNet and CPC will seek financing (grants and loans) to expand the network to residents and businesses in the eight-



OptiNet Timeline

county region. Seven of the counties qualify as economically distressed due to low per-capita incomes.

In 2010, OptiNet doubled its Internet speeds while holding the price steady, offering connections a bit faster than the big cable companies in cities across the U.S. In early 2012, the network again increased capacity without raising prices and added new ultra high speed tiers, including a 1 gigabit per second offering.

Though BVU can deliver a gigabit anywhere in the community, a fair amount of its early subscribers are still connected using an older FTTH standard called BPON (Broadband Passive Optical Network) that is slower than the modern generation of GPON (Gigabit Passive Optical Network). Whereas many new community fiber networks offer the same fast upload speeds as download, BVU has continued the practice of asymmetric offerings. However, OptiNet offers more upstream capacity than most cable providers relative to downstream.

OptiNet eventually took on more responsibility for phone service. It purchased its own switching equipment in 2007 but only phased out its partnership with the local phone company in February 2012. The highly regulated phone business was once intimidating, but BVU realized it has long had the expertise to run all aspects of it.

Virginia law prohibits BVU from cross-subsidizing its phone or cable services. Its audits are publicly

available, giving its competitors considerable insight into its strategy and also offering a second level of scrutiny about whether it is cross-subsidizing. The Tennessee Valley Authority, which now also has oversight, prohibits cross-subsidization from electrical funds and keeps a watchful eye on all utilities that buy power electricity from it.[17] In short, BVU is subject to far more scrutiny in these matters than its private-sector competitors for whom cross-subsidization from one subsidiary to another is common, and who are also free to offer whatever services they want anywhere they choose.

OptiNet now has almost 12,000 subscribers, averages 2.24 services per customer, and maintains a take rate higher than 70 percent in Bristol. The network has expanded to more than 35,000 potential subscribers across its communications territory and will continue expanding broadband access in a region widely neglected by the private carriers. It has kept prices down both in its territory and even nearby areas where OptiNet does not offer services. It remains $24 million in debt but is running in the black.

Additionally, OptiNet is working with Citizens Telephone Company Coop and the Mid-Atlantic Broadband Cooperative to build more open access middle mile infrastructure in Virginia and create a relationship with Virginia Tech that will allow for more remote educational opportunities throughout rural areas of the state.

Beyond the Utility

OptiNet competes against much larger incumbents—Charter, Comcast, and CenturyLink (formerly Sprint).[18] It has the advantage of being more nimble, and is the only provider actually rooted in the community. In order to be nimble, it had to overcome the traditional utility mindset and forge an entrepreneurial spirit. BVU Authority VP of Marketing and Business Development Kyle Hollifield smiled while noting that he likes to "break down walls" when he comes up with a novel idea. It can be hard to convince the utility to change the status quo, he explained, but it is certainly possible.

BVU Authority's electric utility was accustomed to operating as a slow-moving, regulated monopoly. It was a challenge to start a new division that competed in a high-stakes environment, with constantly changing technology and firmly entrenched competitors with abundant resources. It changed this culture by hiring people from outside the utility for the OptiNet team. Among other things, OptiNet required a new approach to marketing and monitoring the business plan. Whereas the electric utility monitors its business strategy on a quarterly or even semiannual basis, OptiNet has a standing biweekly meeting to monitor and adjust its strategies. Subscribers who ask to disconnect OptiNet services are asked why and their reasons are recorded and discussed.

Table 3: BVU Residential Broadband Rate Sheet (Mbps), 2012

Downstream	Upstream	Price
64kbps	64kbps	$16.95
6	1	$26.36
12	2	$35.16
16	3	$39.56
20	5	$49.95
30	10	$59.95
50	20	$99.95
110	20	$169.95
250	30	$259.95
1000	50	$319.95

While other municipal utilities, like those in Tacoma, Washington and Lafayette, Louisiana, operate their telecom divisions separately, OptiNet is integrated into the utility. BVU Authority customer service representatives (CSRs) are cross-trained to handle all 11 services—electric, water, sewer, voice, video, data; data and voice for customers of the OptiNet-CPC venture; and three services from the North Carolina network with which FOCUS works (MI-Connection). The Marketing Department works for all the divisions across the entire utility.

As a direct result of OptiNet, all of BVU Authority's services and interactions with customers improved, including those of its Electric division. Offering telecommunications services forced BVU Authority to be more efficient and focus on customer satisfaction across the board. Customers that are very happy with their

electrical reliability and rates are far more likely to take telecom services from OptiNet than from its competitors.

In late 2011, BVU Authority finished remodeling the lobby and customer service area of its building to be more friendly and efficient while showcasing its advanced services and products. Some 8,000 customers enter the building per month, sometimes resulting in short delays before a CSR is available. Upon entering the open lobby, the customer takes a ticket and waits for one of the screens throughout the lobby to notify them when a CSR is ready to help them. Rather than simply building a waiting room, the utility has constructed a demonstration room split into a living room and work office space that showcases their products. Customers can experience a fast broadband connection to the Internet or test 3D HD movies while they wait.

In the restricted employee-only area, monitors are placed throughout the halls also, but not for entertainment. Each monitor cycles through a series of screens showing the financial performance of BVU Authority across its business areas, and the names of the utility's largest customers.

Running the Business

Any community considering a broadband investment has to decide what work should be created in-house and what outsiders should do. BVU hired employees to design the brains of the network in consultation with outside experts and contracted for building the outside plant. That ensured it had everything needed to control its products and the necessary knowledge to quickly troubleshoot problems.

OptiNet began by contracting out its network operations center (NOC) but later brought it back in house, creating a 24/7 call center to ensure the best possible customer experience.

The utility recognized that having a high quality, local support staff that fully understands all services distinguishes it from its competitors. Cross-training all the CSRs to handle broadband, cable television, and telephone services in addition to the usual utility services with which they were already familiar, took nine months. They go above and beyond the minimal tech support typically provided by national carriers. One CSR took a call from a young girl who asked for

OptiNet's Demo Room

the name of the largest watershed on the eastern seaboard—as though OptiNet ran a homework helpline. He helped her, which probably took the same amount of time as saying it was not his job. This is typical of the anecdotes one hears about OptiNet.

Services, Pricing, and Community Value

OptiNet's prices for phone, cable, and broadband all started lower than competitors and, aside from a few cable rate increases driven by programming costs, they did not change. BVU commissioned a study in 2008 to determine how much the community had saved because of OptiNet. The estimated total was just under $10 million. Cable savings surpassed $5 million, broadband savings were $2 million, and phone savings totaled almost $3 million. Bristol had saved nearly $1 million on telephone services alone due to the lower cost of self-provisioning compared to leasing connections from the then-telephone incumbent, Embarq (formerly Sprint and now CenturyLink). Since 2008, the community savings have undoubtedly continued at a similar pace.

Not only does OptiNet keep more money in subscribers' pockets, but more of the money subscribers pay OptiNet stays in the community. Incumbents typically rely on professional services (e.g., accounting, legal, advertising) supplied by vendors outside the cities they serve, and distribute their profits to shareholders scattered around the country. Incumbents also tend to employ fewer people per subscriber.

In June 2009, for the first time in five years, OptiNet raised its cable rates. It increased the expanded cable

package (the most common tier) by 12 percent to $41.14. Programming costs had gone up 52 percent over that period. In 2011, OptiNet announced cable rate increases averaging $2 per subscriber, explaining that it was due almost entirely to increases in sports programming costs. It also noted that of every dollar in cable revenue, $0.53 goes toward programming costs and only $0.04 is profit for OptiNet. OptiNet's prices in 2011 remain significantly below those of its competitors, most of whom have been increasing rates regularly.

While cable prices have increased, phone and broadband prices are the same as they were in 2003. The speed of users' broadband connections has increased several times over that period. As mentioned above, in 2010 and 2012, OptiNet increased its Internet speeds while holding the price steady.

Beyond the Triple Play

A consultant in this business frequently says, "The triple play is table stakes."[19] The triple play is the *beginning* of services, not the end. Kyle Hollifield notes that the physical connection to the subscriber is a fixed cost and adding network services creates opportunities to increase per-subscriber revenue. Without sufficient revenue, the network may not be sustainable. To this end, OptiNet has a product launch team that plans years into the future. Some products are about generating new revenue. Others, such as caller ID showing up on the television, are add-ons to help customer retention. The cost of re-attracting a lost subscriber is substantially greater than the cost of keeping a current subscriber happy.

Business revenue is the focus of the network, as reflected in the high ratio of business customers to residential subscribers over the years. Before building the network, BVU engaged local businesses to learn what services they needed. Now OptiNet has a variety of customizable telephone options for business customers, including a no-capital-required approach for small businesses. It has long offered transparent LAN services, allowing multiple offices to interact as though they are on the same internal network. Rather than base its prices on what market will bear, OptiNet offers these services at prices below what most providers charge to encourage economic development.

Figure 1: Bristol VA Local Cable TV Prices (mid-tier) 2003-2011

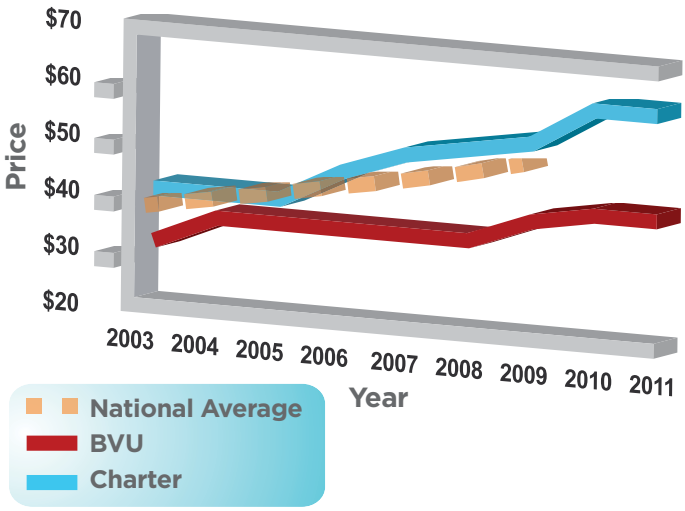
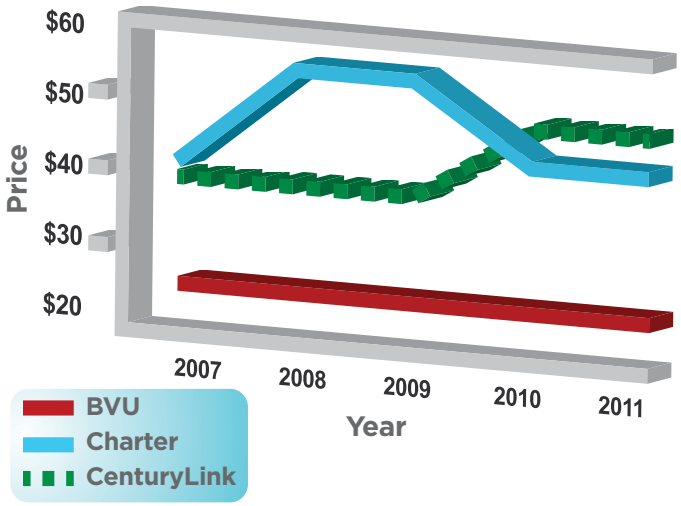


Figure 2: Bristol VA Local Broadband Prices (5Mbps+) 2003-2007



When OptiNet salespeople visit potential customers, they take iPads with an application that allows them to customize the particular package requested, submit the order back to headquarters, and display the final bill. The iPads are more efficient than calling in orders or using paper. Moreover, business customers can see that OptiNet is a professional organization that knows how to use modern technology.

OptiNet sells additional services beyond basic residential and business telecommunications. It has co-location facilities and offers disaster-recovery from its climate-controlled data center. The Virginia Department of Transportation uses OptiNet fiber to connect some of its electronic signs along highways. It runs fiber connections to cell towers. Some areas of

BVU Authority takes the Boys and Girls Club to the theater for a children's show

southwestern Virginia will receive 4G wireless signals only because of OptiNet; other carriers couldn't justify the necessary connections due to the poor return on investment from a private sector perspective. Without fiber optic cables connecting the towers, wireless companies would not be able to get sufficient bandwidth to support 4G standards.[20]

OptiNet operates in cooperation with other providers. For instance, if a hotel chain has a national contract to get services from a national carrier, that carrier could provide it through a leased connection from OptiNet. A nearby independent cable company resells OptiNet services on its own cable network, and a now-defunct wireless ISP used OptiNet for backhaul. OptiNet has direct connections to carrier hotels and data centers from Atlanta to Charlotte to other areas within Virginia. These connections have been essential for attracting large employers, such as Northrup Grumman, to the region.

OptiNet derives some revenue by inserting local ads into television programming but has to coordinate with its Tennessee counterpart, Bristol Tennessee Essential Services. BTES invested in an FTTH network after OptiNet was up and running, leading to lower prices in Virginia than Tennessee residents were being offered from the cable incumbent, Charter. As mentioned above, Charter had lowered its prices on the Virginia side of Bristol in response to competition from OptiNet. Charter spans the state line, offering advertisers a larger target population than OptiNet could offer without coordination with its Tennessee-based brethren. Ad insertion revenues are not insubstantial but networks are limited in how many spots they can offer.

Community Support

OptiNet enjoys widespread popularity. Some elected officials have taken issue with its decisions over the years, but there have not been serious efforts to privatize or shut down OptiNet. Now that Bristol Virginia Utilities is an Authority, it is even more removed from day-to-day politics.

Support for BVU Authority comes from its strong roots in the community. It has a full-time employee for community engagement. Its involvement goes far beyond simply sponsoring activities, which it does frequently throughout the region. Employees are very involved in the boards of local organizations. Kyle Hollifield is on the board at the Chamber of Commerce. The Executive Vice President & CFO currently serves as President of the local United Way and is on the

BVU provides free Wi-Fi at the Rhythm and Roots Festival

Board of Directors at a local hospital. BVU crews regularly assist Habitat for Humanity, and local crews are empowered to solve problems rather than delaying projects by having to report back to headquarters. BVU Authority has woven itself into the fabric of the community, as illustrated by the numerous awards spilling out of a trophy case across from the receptionist in their lobby.

Heritage TV, a local station available on OptiNet, is quite popular for its coverage of music events, local businesses, and high school sports (including the Arby's Classic, a major high school basketball tournament that goes back 30 years). Funding for several of the programs comes from BVU's community engagement budget.

For the past two years, OptiNet has provided free Wi-Fi to the Rhythm and Roots Festival, a major event. It also sets up a hospitality tent with television screens and laptops available to the public. The utility offers free Wi-Fi year-round at the Bristol Mall and award university scholarships to four students each year.

BVU Authority believes maintaining a constant marketing campaign is essential, despite being a well-known local business. Because it is the clear market leader in Bristol, the marketing strategy focuses particularly on the BVU Authority brand. A number of municipal fiber networks argue that they keep overhead lower by not marketing, a practice that Hollifield challenges. "If you want to see the value of marketing, stop doing it for a year. You could lose five years in the business plan." Given OptiNet's success, other networks would be wise to study its approach to marketing.

Economic Development

Given the demise of a local economy based on tobacco, textiles, manufacturing, and coal mining, southwestern Virginia was desperately in need of new industries to revitalize the community. Indeed, much of southwestern Virginia was in the same situation, which is why the BVU-CPC partnership has focused so extensively on connecting commercial and industrial centers to spur new jobs. In 2007, BVU submitted a report to the state highlighting the job gains from its broadband investments (in conjunction with CPC). It traced over $50 million in new private investment, generating 1,220 jobs in seven counties and $37 million in annual payrolls. When BVU applied for a broadband stimulus award, it submitted an updated

estimate of over 2,000 good-paying jobs. Some of these economic development wins were quite notable:

- Northrop Grumman and CGI (a global IT and business process services firm) created some 700 jobs paying almost twice the average weekly wage because OptiNet was available where they wanted to locate. Not all of those jobs went to local residents, but the Intelligent Community Forum reported that 30 percent of the jobs did go to people already living in the area. To ensure future high tech jobs were available to locals, the nearby University of Virginia's College at Wise created an undergraduate software engineering program.

> In 2007, BVU submitted a report to the state highlighting the job gains from its broadband investments. It traced over $50 million in new private investment, generating 1,220 jobs in seven counties and $37 million in annual payrolls.

- In 2010, a partial competitor to OptiNet – DirecTV – announced it was creating 100 jobs in the area because of OptiNet. OptiNet's telecom infrastructure in southwestern Virginia was sufficiently advanced and reliable for DirecTV to locate a virtual call center there. A virtual call center is one where people work from their homes, which requires robust and reliable connectivity.

- Alpha Natural Resources, a major employer in the region, kept its headquarters in southwestern Virginia following a merger with a rival company located closer to the Washington, D.C.-Baltimore metro area. It determined OptiNet could keep it as connected there as anywhere.

Looking back, BVU Authority President and CEO, Wes Rosenbalm, noted that the utility had no idea just how big this project would become. It could not have anticipated the grants allowing it to connect so much of southwestern Virginia. It didn't anticipate being covered by the *Wall Street Journal* or *The Economist*, which raised Bristol's profile internationally and made an invaluable contribution to everything from economic development to community pride.

Lafayette Utilities System

Introduction

Lafayette, the heart of Cajun country in southern Louisiana, has built one of the most impressive next-generation community broadband networks in the country. Lafayette has approximately 120,000 residents living and working in some 58,000 households and businesses. It is the fourth-largest city in Louisiana and has grown every decade since 1890. It is also home to the University of Louisiana at Lafayette.

The community has a long history of self-reliance, reaching back to a unanimous vote in 1896 that established the Lafayette Utilities System (LUS), offering electricity, water, and eventually, sewer services to a small community. The decision to create the utility and build the infrastructure was an important step in Lafayette's path to economic growth, and allowed it to overtake its larger and more prosperous neighbors. In 2005, the community overwhelmingly approved a referendum to authorize construction of a FTTH network, which finally began connecting residents and businesses in 2009. In 2011, LUS estimated that it had created $828 million in "utility bill and tax savings over the past 20 years."[21]

The local government is a consolidation of the City of Lafayette and the Parish of Lafayette. LUS is governed by a board of City-Parish Council members whose districts are comprised of 60 percent or more of Lafayette residents, in addition to a nine member Parish Council. The utility employs approximately 450 people and handles water, sewer, electrical, and communications services.

The region encompassing Lafayette is called Acadiana, a reference to its French origins. Lafayette's French Acadian origin permeates its culture[22] and is a strong source of community pride and independence. This deep historical sense of community self-worth is

Map of Lafayette Parish

one reason many resented the approach Cox Cable and BellSouth took in opposing Lafayette's community fiber network. Cox and BellSouth appeared to be "talking down" when responding to Lafayette's fiber initiative, which both irritated and outraged many in the community. LUS Fiber now competes against Cox and AT&T (the old BellSouth).

Lafayette has been named among the top 10 most conservative cities in America.[23] The City-Parish President, Joey Durel, is a Republican who previously enjoyed success in the private sector as the owner of local pet stores and restaurants. Though skeptical at first, he became a tireless champion of the community fiber network.

The Early Years

After Terry Huval became Director of LUS in 1994, he and his staff began researching alternatives to the outdated microwave communications system the utility had been using since the 1970s. He learned about an impressive cable network run by the municipal electric utility in Glasgow, Kentucky that had kept cable rates extremely low in the community and found the prospect intriguing. Recognizing the increasing need for telecommunications connectivity and opportunities resulting from the 1996 Telecommunications Act (which was intended to spur competition in telecommunications markets), LUS proposed to build a fiber optic ring connecting its facilities. The ring architecture would allow communications to dynamically re-route in the event of a fiber cut or other damage. The utility would need 12 strands of fiber to connect its substations throughout town.

The project cost was estimated at $3 million but LUS discovered it could build a 96-strand ring for just 20 percent more, or $3.6 million. The extra strands, each of which could essentially carry unlimited data, would provide future capacity when needed. The incumbent telephone company, BellSouth, vigorously opposed the idea. BellSouth wanted LUS to lease connections from it but had no experience in providing the specialized, low latency, high speed communications network that a reliable high voltage electric utility system requires. Like most utilities, LUS is extremely particular about reliability and prefers to be in full control of all assets touching its utility operations. By 1998, the City-Parish Council and City-Parish President supported LUS's approach, allowing it to proceed with the fiber ring.

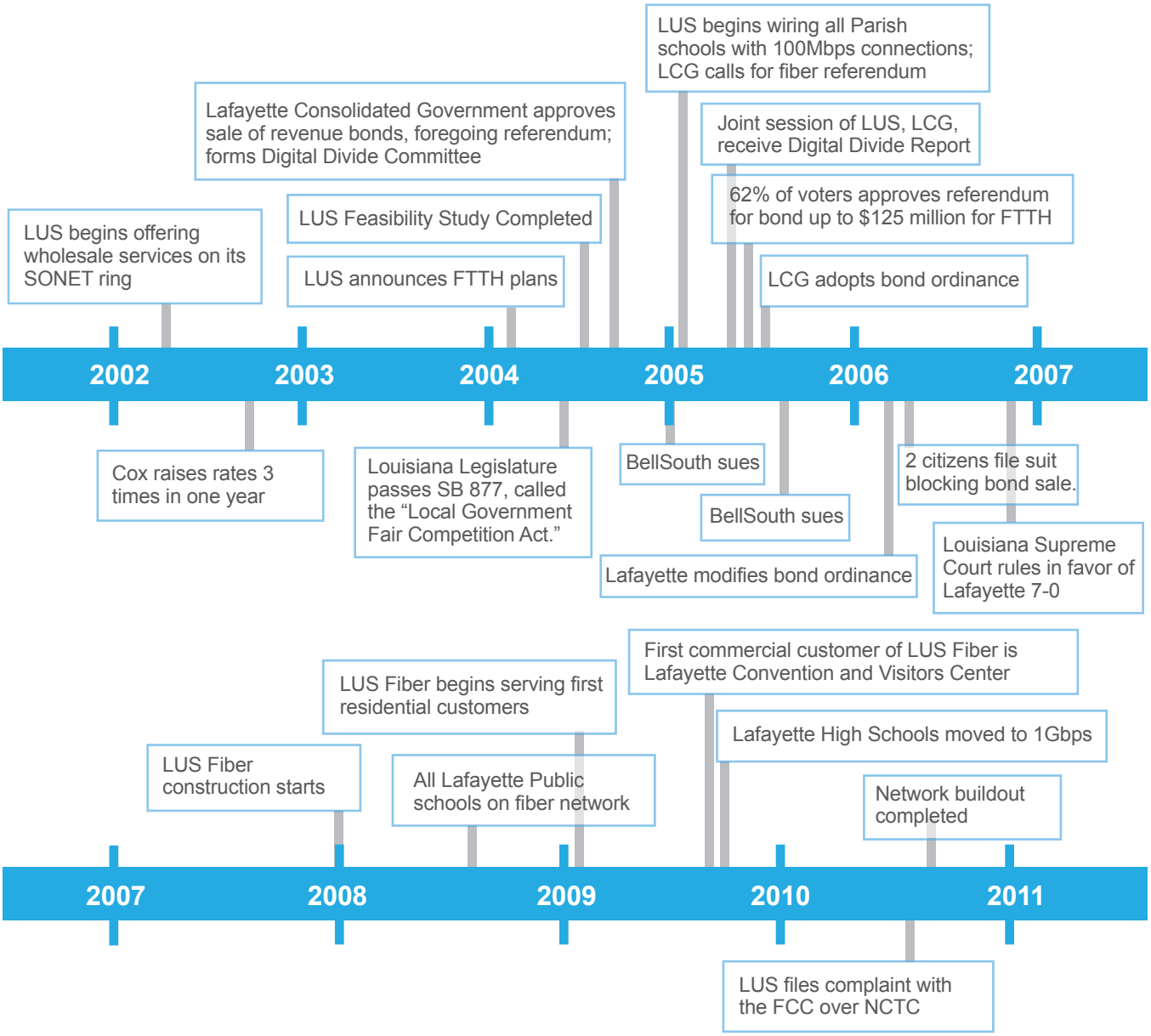
> By 2002, LUS was offering wholesale services and was replacing the City's old 1.5Mbps T1 connections with much faster circuits for the same price.

Shortly thereafter, people at the Chamber of Commerce and others started to ask what could be done with the extra strands. A new task force examined all options, from leasing dark fiber (where the lessee would simply have access to a dedicated strand, and would have to supply its own electronics) to building a full FTTH network where LUS would directly offer services to the whole community.

The dark fiber approach was rejected because it was too limited in scope. After leasing the existing strands, the network would have no additional capacity for interested parties in the future. On the other hand, the task force was uncomfortable with the level of risk involved if LUS began selling retail services at that time. They settled on serving the municipal buildings directly and offering wholesale services to independent Internet service providers that would primarily target business clients.

By 2002, LUS was offering wholesale services and was replacing the City's old 1.5Mbps T1 connections with much faster circuits for the same price. LUS planned to slowly phase in higher prices commensurate with the higher capacity services. LUS staff continued to monitor developments in broadband networks, taking note of the increasing quality and value in FTTH technology.

The next year brought an open race for the City-Parish President. Terry Huval, a local cultural icon in part due to his incredible fiddle skills, endorsed and appeared in ads with one of the candidates who was then the Chief Administrative Officer of the Lafayette Consolidated Government. Huval found himself in a difficult position when that candidate lost the election to Joey Durel, a local businessman and former Chairman of the Board of the Chamber of Commerce. Huval was not sure what to expect, having allied himself with the



LUS Fiber Timeline

new City-Parish President's opponent, but Durel asked him to stay on as head of LUS. Emboldened by the vote of confidence, Huval suggested a project Durel might consider and proceeded to show him a notebook with information on municipal fiber networks in Bristol, Virginia, and Dalton, Georgia.

Durel recalls saying, "Terry, why would I want to compete with the private sector?" But the new City-Parish President, who prides himself on an open mind, recalls talking about it for another 30 minutes before saying he was skeptical, but "shame on us if we don't at least look at this, shame on us if we don't take it to the point where we can't go any further."

Talking with Durel, a successful businessman turned elected official, quickly elicits a sense that the man is solely driven by his desire to improve Lafayette rather than by ideological pre-convictions or what is most likely to get him re-elected.

Durel utilized five advisers as the city examined its options. Each was a technologically proficient, successful businessperson and two had previously served as Chairman of the Board of the Chamber of Commerce. Durel's advisers served two purposes: an independent review of any plan from a non-government perspective as well as establishing a base of support for a network if it proved feasible.

Durel is quick to remind people that Lafayette already had DSL and cable access to the Internet when it started down the community network path. Though Cox Cable was slow to upgrade its network relative to similar networks on the coasts, Lafayette was not bereft of broadband. In his words, "We wanted more." He regularly encouraged BellSouth or Cox to commit to a FTTH project so the city would not have to, but both argued Lafayette already had sufficient broadband options.

> At one point, Cox raised prices three times in one year in Lafayette – and ultimately six times in four years.

His focus was on the future, specifically keeping Cajun kids in Cajun country. He saw how parents were tired of seeing their children complete their education in Lafayette and then have to move away to find work – often to Houston or Dallas. Lafayette needed a network that would ensure the community could take advantage of the digital economy, allowing the next generation to build businesses and careers close to home.

While LUS was evaluating its options, Cox was rapidly increasing rates. At one point, Cox raised prices three times in one year in Lafayette – and ultimately six times in four years. Moreover, Cox, a national cable company, focused its investment in its territories on the coasts, leaving Lafayette in the slow lane in accessing the Internet.

The Battle Begins

In early 2004, LUS felt FTTH technology had sufficiently matured for its desired approach and wanted to assess the community's interest with a market survey. Unfortunately, major cable and phone incumbents had been pushing legislation to ban community networks in states around the nation. Not wanting to tip his hand, Huval waited until no new bills could be filed in the state legislature for the 2004 session before announcing the market study that would determine if LUS should proceed to the next step of its network. BellSouth and Cox lobbyists quickly worked the Legislature, taking an existing bill that was not going to be moved and rewriting it to ban local governments (and their public power authorities) from building networks. This was the first shot in what has been the longest community broadband battle in the nation.

Like many communities in this position, Lafayette could only justify hiring a single lobbyist to defend them. Huval likes to say that they hired the best, a Lafayette native, and others agreed. Under no such limitation, the private providers fielded far more lobbyists. Louisiana Governor Kathleen Blanco, another Lafayette native, had served on the Public Service Commission overseeing the telecom companies and was sufficiently skeptical of BellSouth and Cox's motives to be dubious of the preemptive legislation. Nonetheless, the collective lobbying power of the telephone and cable companies was too great to simply dismiss their bill.

The Governor announced that LUS, Louisiana Energy and Power Authority, Louisiana Municipal Association, Louisiana policy jury association, and the various incumbent providers would have to compromise on a bill, SB 877. It would be named the "Local Government Fair Competition Act" but become more widely known as the "Unfair Competition Act" due to the many advantages big companies like BellSouth and Cox have over community providers. LUS brought in Jim Baller, a national fixture in these debates, to help reach a compromise that all sides could live with.

The bill passed in July. By fall of 2004, LUS had completed its feasibility study and the City-Parish Council voted for the sale of revenue bonds to finance the project in December. LUS, the City-Parish Council, and the State Bond Commission unanimously supported the ordinance.

The Republican and Democratic parties of Lafayette Parish join together to encourage anyone unable to vote on July 16 to vote absentee in favor of the LUS Fiber Referendum

Every vote is important for our city's future.

VOTE YES!

ABSENTEE VOTING
In person at the Lafayette Registrar of Voters Office from July 5 to July 9.
Bring a picture I.D. Voting hours: 8:30 a.m. until 4:30 p.m.

MAIL BALLOTS
Send a signed letter requesting a ballot. Letter must be received by Tuesday, July 12.

The Registrar of Voters Office is located at
1010 Lafayette Street, Suite 313, Lafayette, LA 70502
Hours: 8:30 a.m. - 4:30 p.m.
291-7140

PAID FOR BY LAFAYETTE COMING TOGETHER PAC

Both Parties Helped to Get Out the Vote

Though Lafayette had bargained in good faith as requested by the Governor and proceeded as prescribed by the legislation, BellSouth and Cox blocked LUS's efforts using a variety of tactics, including lawsuits. BellSouth challenged Lafayette's *bond ordinance*, claiming that the bonding statute required a referendum before issuing bonds.[24] The "Fair Competition Act" emphatically did not require a referendum but BellSouth developed a legal strategy to force a referendum by challenging the City's authority in other areas.[25] After BellSouth received a favorable ruling, Lafayette decided that holding the referendum would be more expedient than appealing the decision.

In the middle of March, the City-Parish Council called for a vote that would take place on July 16.

Lafayette Comes Together

Even before the referendum decision was made, Lafayette residents John St. Julien, Mike Stagg, and others were organizing grassroots efforts and writing regularly about the fiber fight on various websites, including LafayetteProFiber.com. Doug Menefee, a local business technology leader and blogging advocate,[26] strongly encouraged John and Mike to blog about the broadband battle. Mike Stagg recalls that their first foray into blogging was at an event sponsored by the incumbents and their allies, criticizing the prospect of a community network.

Stagg, St. Julien, and others created a group, Lafayette Coming Together, which operated on the principle that if you wanted to be influential, you had to participate. Lafayette Coming Together was a strong complement to "Lafayette Yes," a group comprised of the more connected establishment supporters of the network. There was occasional suspicion and distrust between the groups, but Durel argues that they both needed each other for the effort to succeed.

Lafayette Coming Together was an incredible grassroots approach to community organizing, something no other community broadband effort has come close to matching. The group created websites and associated e-mail lists, and began running a weekly ad in the paper. The ad listed local people who supported Lafayette's fiber project, and provided links to the website where readers could get more information. There, they could sign up for the e-mail list or as a public supporter in a future ad. The group garnered more interest ever week and the e-mail list quickly increased to hundreds of people, with an inner group of perhaps 9 to 15 residents meeting regularly to strategize and plan events. This represented a staggering level of community involvement in decisions around telecommunications infrastructure, particularly for 2005.

Among its many pioneering approaches, the group embraced video. Most people were still not aware of something called "YouTube" when Kevin Domingue of Lafayette Coming Together suggested a fiber film festival. The general consensus was "Sure, go for it," even as several of the group members privately expected little to result. The idea was popular, and one of the videos captured the essence of the incumbent operators with a character called "Slick Sam" who tries to pass a tandem bicycle off as "functionally equivalent" to a race car. Slick Sam didn't just win the film festival; it continues to pop up in communities around the country dealing with similar dissembling from incumbent providers.

Another successful tactic used by Lafayette Coming Together was to quickly and creatively respond to misinformation perpetuated by BellSouth and Cox regarding Lafayette's FTTH project. The companies used "push polls" to disseminate distorted information to residents in the form of fake research surveys.

At one iconic moment during the lead-in to the referendum, a fiber supporter recorded his experience with a push poll in which a so called "researcher" asked a series of questions intended to make the receiver oppose the referendum. Over the course of 35 minutes, the pollster painfully stumbles his way through

Slick Sam from the Fiber Film Festival

A Fiber Flyer used to Educate the Community

the script, which included the false claim that private companies are already building a fiber network. He asks how the listener would respond to the statement, "If Lafayette has the money to build a $125 million fiber system, they [sic] should fix the streets first. Better streets are more important than duplicating what private companies are already doing."

The poll claimed friends of elected officials would make millions off LUS Fiber. It tried to inflame the north/south Lafayette divide, which is largely along race and class lines, by suggesting that not all parts of the community would be equally served. The poll also falsely claimed that the Freedom of Information Act would allow anyone to find out what movies someone watches and websites they visit.

At one point the caller received a priceless snappy response when asked how the listener would respond to the statement that the courts would prohibit religious programming on LUS Fiber: "The author of the question is an idiot, that's how I would respond to the question."

Lafayette Coming Together edited the audio file and distributed it to supporters. It caught fire as people forwarded it to family and friends. The effect was powerful.

Lafayette Coming Together was also diligent about tracking down and exposing who was paying for the glossy mailers (e.g., by following up on the mailing permit), push polls, and other campaigns. Mike Stagg called it an effort to "pierce the veil of who was doing what to us," explaining that BellSouth and Cox were

trying keep their fingerprints off the opposition due to their low credibility in the community.

Daily blogging about the incumbents' attack was also found to energize Lafayette's base. Just about every day, often more than once, John St. Julien posted something on the Lafayette Pro Fiber blog that helped keep activists inspired; just seeing those new posts gave a sense that they were making progress.

The result was a landslide 62 percent yes, with 27 percent of eligible voters casting ballots for a single issue election — an impressive turnout for a non-national election.

Tapping into experienced campaign networks also boosted the reach of Lafayette Coming Together. Both the Democratic and Republican Executive Committees endorsed the City for the referendum, the result of local party members enthusiastically urging endorsement of their respective parties. Republican and Democratic Party support was invaluable on Election Day, thanks to their experience getting the vote out.

The result was a landslide 62 percent yes, with 27 percent of eligible voters casting ballots for a single-issue election—an impressive turnout for a non-national election during summer in the United States. LUS received permission to issue up to $125 million in revenue bonds to fund the project.

In retrospect, John St. Julien recalls being nervous at the prospect of the referendum. He was aware of AT&T and Comcast's campaign against a municipal FTTH effort in the Tri-Cities Area of Illinois, and worried that the funding and advertising advantage enjoyed by Cox and BellSouth could overwhelm the support citizens already had for the fiber plan. In retrospect, he thinks the referendum was a mandate for local government: The people had spoken.

Fighting in the Courts

In September 2005, the City-Parish Council again approved a bond ordinance to issue 25-year bonds up to $125 million. Shortly thereafter, the community again found themselves in court with BellSouth, which claimed the bonds were a form of cross-subsidization because the general revenues of the utility indemnified them. This means that if LUS Fiber could not pay its debt, the utility would have to use its other revenues to pay the investors.

Another series of court battles ensued. Though the District Court ruled in favor of LUS, BellSouth appealed and the Court of Appeals overruled the lower court decision. Once again, Lafayette decided the best route was not to appeal but rather to satisfy the road map offered by the Court of Appeals on how the bond should be structured. On March 21, 2006, Lafayette revised the bond ordinance, only to be sued again, surprisingly not by BellSouth, but by local residents, and over the same bond question. To this day, LUS and its grassroots supporters remain unsure why those local residents intervened or how they financed their impressive legal team.

Again, the District Court ruled for the City. In a surprising turn, the Court of Appeals disregarded its previous ruling that instructed LUS how it should proceed on the bond, and found new grounds to rule against the City. Finally, the City decided to take its case to the Louisiana Supreme Court, which unanimously found in its favor on February 22, 2007.

By the end of 2007, LUS had issued $110 million in bonds at a 4.9 percent interest rate and was able to begin selecting contractors for the network it had spent so many years planning. LUS believed it could build the system successfully without bonding for the full $125 million authorized, which helped it avoid the larger interest expense. Network construction began in early 2008. BellSouth and Cox had delayed the project for four years, forcing Lafayette to spend millions defending its right to build its own network.

It took until February 2009 to start signing up retail customers, and even longer before LUS began offering services to local businesses. The Lafayette Convention and Visitors Center (LCVC) was the first business customer, signing up in June 2009 for the 50Mbps symmetrical Internet access package at $119.95 per month. LCVC now had a connection 33 times faster than its previous T1 from an incumbent, at a lower price. The entire network pass was finished in the early weeks of 2011.

Unanticipated Challenges

LUS has taken a stoic approach publicly, but it has had to face two serious, largely unanticipated challenges that negatively affected its bottom line. The first, and far less serious, is Cox's continued attempt to turn LUS's transparency into a liability. According to Huval's testimony before the U.S. Senate's Small Business and Entrepreneurship Committee, "Since the Supreme Court decision, Cox Communications has made very frequent public records requests and is using other tactics to attempt to undermine Lafayette's market penetration efforts."[27]

> "Since the Supreme Court decision, Cox Communications has made very frequent public records requests and is using other tactics to attempt to undermine Lafayette's market penetration efforts." - *Terry Huval Testimony*

LUS must periodically submit to state audits to ensure its network is not being subsidized by the Lafayette Consolidated Government. Cox announced it would intervene after the Public Service Commission gave the utility a clean bill of health for the most recently audited period (fiscal years 2008-2010). The intervention will lead to additional administrative costs for LUS, annoying City-Parish President Durel, who stated in a press release "We are not sure why Cox and the LCTA have intervened, unless it was to create further mischief, expense and distraction for our local taxpayers."[28]

The more damaging matter, until a recent settlement resolved the matter, was unanticipated hassle and higher than expected cost of video content needed to provide cable services. Any community that wants to offer broadband quickly finds it must also offer cable television to generate sufficient revenues to meet debt obligations. Though the margins may be razor thin on cable services, more customers subscribe to broadband when they can bundle it with other services.

Community networks lack the subscriber base, and therefore the bargaining power, of the large corporate providers. Fortunately, there is a solution: a cooperative of many networks that negotiate channel contracts using their collective buying power. The largest is the National Cable Television Coop, NCTC, which is rivaled in subscriber base only by Comcast.

LUS's feasibility study assumed it would gain entry into NCTC, just as many other municipal networks and small private operators have. In fact, the much larger cable companies Cox and Charter had joined as well. But NCTC unexpectedly denied entry to three municipal fiber networks.[29] Chattanooga, Lafayette, and Wilson in North Carolina, were all refused entry and subsequently threatened to file a complaint with the FCC over what appeared to be anti-competitive action. Shortly thereafter, NCTC announced Wilson and Chattanooga could join but would give no reason for the continued rejection of Lafayette.

Chattanooga and Wilson were not told what disqualified them initially and were only accepted on condition that they remove themselves from the complaint to the FCC. That left Lafayette alone, filing its complaint in early summer 2010. The LUS Complaint filed with the FCC states that the value of NCTC membership totals millions of dollars annually. As cable contracts are its largest operating expense, exclusion from NCTC blew a hole in LUS's financial plan.

The FCC did not openly act on the complaint but LUS and NCTC arrived at an agreement that was announced in January 2012. Huval offered very limited comments about the resolution, only saying that it represented long term future savings that would not be immediately apparent.[30]

The damage went beyond just having to pay higher fees than competitors. LUS had to negotiate contracts with more than 300 video programming distributors, some of which were not interested in negotiating with small providers. While LUS Fiber could have joined a smaller cooperative (like the National Telco Television Consortium), it might have still had to pay more for its content than rival Cox.

Recent Performance

Lafayette was able to complete the citywide rollout ahead of schedule, which allowed them to connect more subscribers more quickly than anticipated. However, as discussed in the digital divide section below, the network

LUS Rolls out Fiber

eschewed the common strategy of building the network first in neighborhoods most likely to subscribe in higher numbers (typically more affluent areas). Instead, Lafayette opted for a more equitable rollout that did not maximize revenue in the early years.

The network has overcome more than its fair share of obstacles, several of which increased the costs of doing business beyond what was expected. For example, it found that the wiring inside homes was often substandard, requiring technicians to spend more time inside homes. Additionally, training new staff took longer than anticipated.

The first few years for a community fiber network are the most difficult because expenses far outpace revenues while the network grows. The costs of acquiring a new subscriber can take years to pay off, resulting in large deficits that cause concern to citizens and elected officials. The existing cable and DSL providers often offer unpublished discounts to customers when they attempt to switch to the community network. New networks have to deal with glitches in vendor equipment and become comfortable with a slew of new processes.

All modern networks, which utilize incredibly complex cutting-edge technologies, encounter difficulties. One of the most significant for LUS was that the first set-top box it used to distribute video programming had occasional glitches that frustrated early subscribers. In June 2010, LUS upgraded the boxes and improved service.

LUS refuses to divulge the exact number of subscribers it has—one of the few ways it is at parity with Cox, which is allowed to keep secret anything it chooses. Nonetheless, LUS announced that “many thousands” had subscribed by mid-2010 and more were taking the full triple-play than expected. The more services subscribers take, the more revenues generated, and the faster LUS can pay off its debt.

LUS submitted two broadband stimulus applications under the American Recovery and Reinvestment Act to increase digital inclusion; neither was accepted. An $11 million Smart Grid grant was funded by the Department of Energy to replace older meters with smart meters, but that has had little impact on the fiber division aside from a trickle of revenues from the Electric division to pay for its use of the fiber network.

Due to the above challenges, particularly the higher costs for video programming and with unanimous support from the City Council, LUS issued bonds in January 2012 for the remaining $15 million authorized by the referendum. LUS Fiber had also taken a $5.58 million inter-division loan from LUS earlier in 2011 for similar reasons. Because the operating expenses were greater than forecast (in significant part due to delays in joining NCTC), LUS needed to ensure it still had

Table 4: Comparing Cox and LUS Pricing

LUS Fiber	LUS Price	Cox Comm.	Cox Price
Cable Offerings			
Basic	$19.95	TV Starter	$21.99
Expanded Basic	$53.99	TV Essential	$60.29
Receiver	$6.50	Receiver	$7.99
Digital Access	$58.99	Advanced TV	$65.98
Internet Offerings (Mbps Downstream/ Upstream)			
10/10	$28.95	3/.384	$37.99
15/15	$34.95	15/1.5	$51.99
40/40	$49.95	25/2.5	$64.99
75/75	$99.95	50/5	$92.99
100/100	$199.95		
1000/1000	$999.95		
Phone Offerings			
Basic Line	$15.95	Digital Telephone Essential	$22.99
Basic Line + unlimited long distance	$30.95	Digital Telephone Essential + unlimited long distance	$40.67

enough capital on hand to continue connecting new subscribers until the network became self-sufficient. LUS is generating sufficient revenues to pay its operating costs and Huval anticipates the network will be fully self-sufficient in two more years.

LUS announced a price increase for video content in January a few weeks after Cox announced increases for all three of its services in late December 2011. In March 2012, LUS Fiber restructured its services. Though it did not change its basic tier for Internet Service (10/10, $28.95) it did increase both the capacity and price for other tiers and introduce a new tier of 15/15 at $34.95. LUS also created new bundles, offering discounts for those who took multiple services. Bundle subscribers agree to a one year contract that comes with a six-month promotional price.

Community networks have typically eschewed promotional pricing because surveys typically show that residents do not like it, but experience suggests consumers respond to it regardless of whether they like it or not. Unlike some national cable and DSL companies, the LUS Fiber website does not hide the non-promotional price, saying "$71.95 for Six Months – Save $323.64 over the regular price of $125.89/month" in discussing its base bundles.

Digital Divide / Community Input

At a December 2004 meeting, the City-Parish Council endorsed the development of a Digital Divide Committee. The Committee issued its report, *Bridging the Digital Divide: Crossing Over to a Technology Future Together,* in the middle of the referendum fight on May 17, 2005.

The report emphasized that reducing the digital divide is not a matter of charity, but rather rational self-interest for the community. Network theorists remind us that networks are more valuable the larger they are. Telephone networks are useless if there is no one to call and considerably more valuable when connecting 1 million people as compared to 100. Thus, finding ways to ensure everyone who wants to connect to the network can do so increases the value of the whole network.

In receiving the report of the Digital Divide Committee, the City-Parish Council called upon LUS to incorporate "elements of the report," noting:

> The development of programs that benefit low income residents' utilization of technology, such as the affordable availability of computers, the provision of educational programs and the adoption of principles such as the universal availability of service, should be encouraged.[31]

LUS took its obligation seriously, incorporating many of the suggestions. Prices were set 20 percent below Cox's rates, and LUS provided access to schools, libraries, and other community anchor institutions on very favorable terms. LUS and community activists searched for, but were unable to find, television set-top boxes that would allow subscribers to access e-mail and basic websites via their cable television package at no extra charge. The network created more opportunities for the Acadiana Open Channel (public access television) to cover a wide variety of live events by providing fiber connections for video crews throughout the city.

> "Public ownership of an advanced telecommunications network is sufficiently rare that models of municipal best practices simply do not exist in any mature form. As a consequence, there has been a natural inclination to adopt the business models used by private providers. However, the constraints and purposes of public ownership are substantially different from those that guide for-profit organizations." - *Lafayette League of Women Voters*

Deploying to high-income and low-income neighborhoods at the outset has been one of the more difficult recommendations to complete. As noted earlier, BellSouth and Cox attempted to divide the community by suggesting LUS would prioritize the more prosperous areas of town. The Digital Divide Committee recommended that LUS build the network simultaneously in low- and high-income areas:

> One of the initial fiber implementation areas must have a substantial under-served population ... for marketing reasons, to build faith in the project among under-served communities, and to provide a test bed for implementing and adjusting the digital divide plan.[32]

LUS agreed to that recommendation—although, from cash-flow maximization perspective, LUS *should* have built the network first where it would find the highest take rates (and probably the highest margins), allowing those revenues to start flowing first. The more equitable deployment pattern may have lessened its take rate and margin, therefore increasing the amount of time necessary to break even financially. However, LUS anticipates a higher degree of loyalty and acceptance in the community because it is not acting like a typical cable or phone company.

If he could do it again, City-Parish President Durel says he would encourage a rollout plan that prioritized the neighborhoods with the highest support in the referendum, on the assumption that these areas would have the highest density of early adopters and to reward those who supported the network most.

LUS developed a unique approach to maximize bandwidth capacity to all its subscribers: 100Mbps in-network communications. The principle is again one of equity: all users of the local network are equal. If users subscribe to the 10Mbps Internet package, they will connect to resources outside the LUS network at 10Mbps. But if they connect to another user on the LUS network, that connection will be at 100Mbps, or close to it (see Figure 3). This approach encourages new applications that are rooted in the

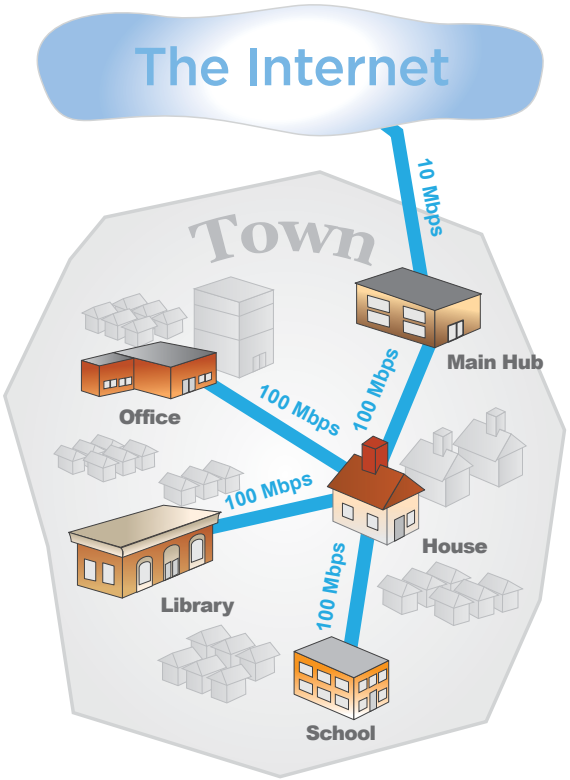


Figure 3: Even subscribers to the base 10Mbps package connect to everyone inside the network at 100Mbps

community and gives subscribers a good reason to encourage their neighbors to join.

LUS was encouraged to keep prices on basic packages low, and strived to do so. The lowest tier of Internet access is 10Mbps symmetrical for $28.95 per month, a price and speed unmatched in any community with a standard DSL/cable duopoly. Unfortunately, the capital cost of connecting a user to the network can run over $1,000. Even if there were no operating costs, LUS would take years to break even on a customer subscribing only to its basic Internet package. For that reason, LUS Fiber had required a minimum charge of $45 per month for each subscriber. Subscribers could either sign up for a higher-end Internet-access package or add phone or pay television service to meet that minimum charge. However in early 2012, LUS decided to relax the $45 per month requirement as part of its new rate structure.

> "The construction of a community-owned communications network in Lafayette brings with it the freedom to ask questions and explore possibilities that would prove impractical elsewhere." - *Lafayette League of Women Voters*

Some digital divide activists are strongly encouraging LUS to invest in a wireless network on top of the fiber infrastructure. If it were to do so, offering a very low cost basic wireless Internet package would then be feasible. In addition, having ubiquitous wireless access would be a terrific amenity for those who already subscribe to the service.

The community has high expectations of the network, and there is some frustration that LUS is not acting more quickly. For example, it has resisted recommendations to develop a Citizen's Oversight Board that would represent "the community as ombudsmen and advocates to ensure equity and maximum public benefit." Reducing the community's digital divide is a difficult challenge and will require patience and understanding from Lafayette's residents.

> "Often it seems technological advances work to increase the divides within communities by providing their advantages first to those able to pay the price for expensive new technology. As the old saying goes, "The rich get richer and the poor get poorer." The chief exception to that rule has been the intervention of public utilities with their credo of low prices and universal service. Water, sewerage, gas, electrical, and phone utilities were all in their time effective ways of spreading the benefits of new technologies beyond the privileged few." - *Lafayette League of Women Voters*

LUS must balance this goal against the need to stabilize operations in light of its legal and financial challenges. Once LUS comes closer to financial sustainability, Lafayette's citizens will get a better sense of its long-term commitment to those governance and digital divide questions. Until then, it will likely focus on keeping the network operational and keeping the subscriber count growing, because that is how its performance is most likely to be evaluated in the public arena.

While the community is waiting for LUS to hit the next milestones, residents should thumb through a first-of-its-kind study developed by the Lafayette League of Women Voters, *Everybody's Network: Building a Vibrant, Connected Community through Lafayette's Fiber Network Ownership.*[33] LUS Fiber is a community network – which means its success is in the hands of the community, not just the public utility.

LUS Fiber Benefits

When community networks are evaluated, they are often judged solely by a balance sheet of direct revenues and expenses, as though they were a private company. The value of newly generate community benefits, such as additional competition within the community, is not included. While a private company looks at its balance sheet narrowly to see what impact its operations have on its investors, a publicly owned network should take a more holistic approach.

The LUS Fiber investments have brought many benefits to its entire community beyond simply creating competition and lower prices for its own triple-play services. Even Cox subscribers are seeing savings.

As noted above, Cox had raised rates in Lafayette a stunning six times in four years. Facing LUS's possible entry into the market, Cox chose not to raise rates from 2004 to 2007. According to Terry Huval's testimony before the US Senate Committee on Small Business and Entrepreneurship,

> Estimates indicate that Lafayette citizens and businesses saved nearly $4 million due to these deferred cable rate increases, so in a roundabout way Lafayette's citizens saved in reduced cable TV rates the amount the city spent defending itself in this extensive litigation process.[34]

Cox has since raised its listed rates to catch up but is running frequent promotions and sends salespeople door to door with deep discounts to win back lost subscribers. As Huval notes:

> Cox has increased its rates in the multi-parish area, which includes Lafayette, and is going door-to-door to offer lower customized pricing to regain customers already being served by LUS Fiber. Apparently the notion of 'fairness' espoused by the private companies does not include the increasing of rates to customers in non-Lafayette areas who have very few competitive options which allows Cox to use the resultant higher revenues to offer much lower pricing in Lafayette areas where there is now meaningful competition from LUS Fiber.[35]

An often overlooked community benefit of LUS is the increased amount of money staying in the local economy. While a private company evaluates its success in some respects based on the amount of money that flows from the host community to distant investors, a public network maximizes the money left in the community. Using conservative estimates of Cox's average discounts, coupled with the lower prices in LUS Fiber, LUS estimates the fiber system created $250,000 in savings in 2009, over $4 million in 2010, $5.5 million in 2011, and so on into the future – projecting a total savings of between $90 and $100 million over the first 10 years of the project.

A third benefit LUS has brought to Lafayette is significantly higher broadband capacity for its schools at lower rates than they would be charged by the incumbent providers, saving tax dollars. When LUS originally began building its fiber ring in 2000, it asked the schools if they wanted to partner. Five years later, LUS announced that it would wire the Lafayette Parish School System (LPSS) – taking a 100Mbps fiber connection to every public school, even those outside the city limits. The schools had been paying $340 per month per location for 1.5Mbps T1 lines and had a 30Mbps connection to the Internet feeding the school network. LUS upped the 30Mbps to 90Mbps and began connecting schools with 100Mbps connections for a modest increase, charging $390/month per location (see Figure 4).

By July 1, 2008, all the schools had the 100Mbps connections. One year later, all the high schools had upgraded to 1Gbps and LPSS increased its Internet connection to 200Mbps. Even though LPSS pays only 30 percent of the cost of its connections (with the remainder reimbursed by the federal E-Rate program),

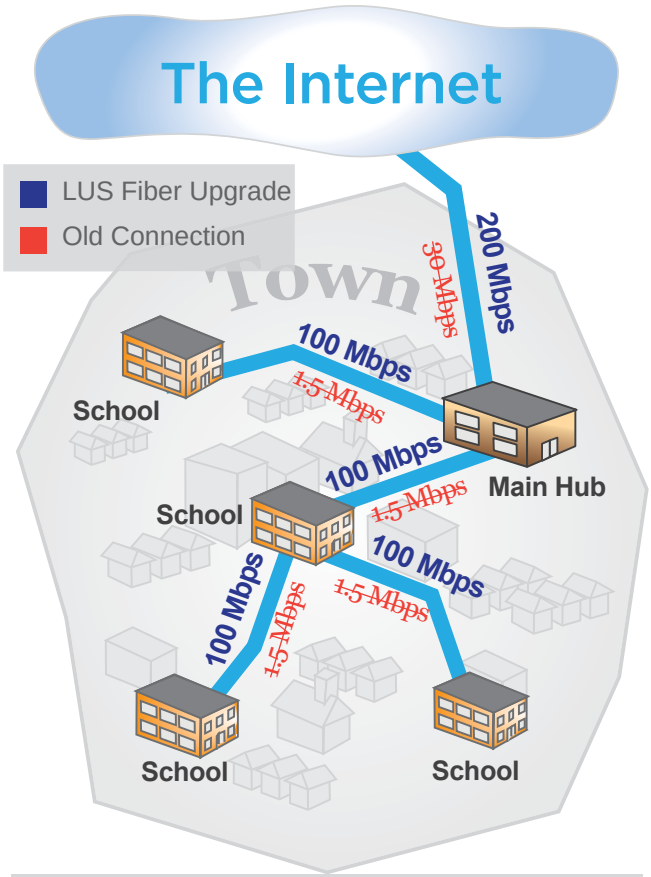


Figure 4: LUS Improved Broadband Connections to Schools

LUS Fiber kept the costs extremely low for connections that would cost far more from an incumbent provider. To give perspective, AT&T's 2011 prices for similar services to schools in Wisconsin for 100Mbps is $2,706 per month. A school limited to paying $390/month would get a 0.5Mbps connection from AT&T.

In addition to the much higher capacity connections, LUS provided the schools with a new voice over IP (VOIP) telephone system and a variety of other benefits. Beyond the budgetary savings, these connections provide Lafayette students with unique opportunities, such as a recent virtual discussion with a classroom in San Francisco.

> "The principle of equity reflects a commitment to ensuring that the whole community benefits from the new network Lafayette now owns and that access to the network is not allowed to exacerbate existing divides within the community. This principle is arguably the most fundamental issue for a community owned resource: a commonly owned resource should benefit all and should be operated so as to reduce the differences between its citizen-owners."
> - *Lafayette League of Women Voters*

St. Thomas More, a private school in Lafayette, subscribed to a 100Mbps connection from LUS Fiber but found it needed even more capacity after giving all its student's Internet-connected devices. When LUS Fiber announced the 1Gbps connections on April 5, 2012, school Principal Dr. Menard was there to ask if her school could be the first customer. According to LUS, the cost of a gigabit circuit in Lafayette from the other providers had been $20,000 per month but LUS Fiber decided to offer it for $999.95 per month.

The public libraries in the parish use a similar hub-and-spoke model to the public schools, sharing a 90Mbps connection from LUS that the federal E-Rate program considers the best value when compared to all the other potential providers. Libraries within the city have LUS Fiber connections, whereas those in the parish but outside the city lease lines from other providers to share that 90Mbps connection.[36]

LUS already pays significant fees (7.45 percent in 2008) directly into the Lafayette Consolidated Government's general fund. As the Fiber division becomes profitable, its payments to the general fund will increase. Though LUS, like many community networks, are accused of having an advantage by not paying taxes, the truth is that the utility typically makes substantially more "In Lieu of Taxes" payments to local governments than incumbents pay in local taxes.

LUS's high-capacity, lower-priced bandwidth is saving taxpayers in other ways. When the Lafayette Consolidated Government began a program using traffic cameras, Cox connected the cameras as part of the franchise agreement. When it was time to renew the arrangement, Cox wanted to increase the fee. Rather than pay higher rates to Cox, the City transferred to LUS Fiber, which provides high capacity connections at a lower price. The community network is helping to create a more efficient local government and get more bang for the taxpayers' buck.

Cox chose Lafayette to be the first market in the United States to receive its 50Mbps service in April 2009. Though a national Cox spokesperson stated that Lafayette demonstrated "loud and vocal demand," she denied that LUS was a factor in the decision. In later interviews, she admitted that the market was chosen due to its competitiveness.[37]

Perhaps one of the most understated benefits of the LUS network has been its effect on community pride, increasing hope among Lafayette's youth and economic enthusiasm in the Parish. Before Chattanooga became the best-known municipal fiber network in the nation, *USA Today* spilled a lot of ink on Lafayette and its David-versus-Goliath story. Durel

LUS service truck

spoke of how incredible it was to get letters from nearby Biloxi or far-away Copenhagen congratulating them on the network. For a community more often associated with football, good music, and great food, being home to a crowning technical achievement has become a matter of local pride.

Lafayette put itself on the map, and businesses noticed. NuComm International was seeking a location for 1,000 jobs and settled on Lafayette because of the network and the entrepreneurial spirit that it represented. Pixel Magic, a special effects studio for movies, built an office in Lafayette while working on "Secretariat," which was filming nearby. They liked it so much they decided to create a permanent office there, and 100 to 200 jobs. The company noted the importance of LUS Fiber network in making its decision: "The fact that we have the high-speed Internet between here and there is a big plus so we can show the clients the work in progress — production companies and studios."[38]

Perhaps even more interesting are the people who have moved to Lafayette (often *back* to Lafayette) in large part because of the promise around the network. They are creating small businesses now, but some small businesses with local advantages become bigger businesses. Once, it was access to a canal, railroad, electricity, or highway that attracted businesses. Now it is access to the Internet.

Something is working – Lafayette was ranked the sixth-fastest growing economy in the nation in September 2011 by the Bureau of Economic Analysis. The Lafayette Metro area had the largest percent increase in median household income from 2007-2010 according to a study released in February 2012.[39] Though much of Louisiana has benefited from its oil and gas resources during the recession, it was Lafayette that grew the fastest.

Chattanooga Electric Power Board

Introduction

Chattanooga is located along the Tennessee River in southeast Tennessee. Snuggled against the Appalachian Mountains, it was a darling of outdoors enthusiasts before it built the network that turned it into Gig City, USA. Chattanooga is the county seat of Hamilton County and, with almost 170,000 people, is the fourth-largest city in the state.

Chattanooga's Electric Power Board (EPB) serves 170,000 households and businesses in the Chattanooga metro area and surrounding communities all the way into northern Georgia. Its total territory comprises 600 square miles, including nine additional municipalities in Tennessee and two in Georgia. The Electric Power Board was formed in 1935, distributes power from the Tennessee Valley Authority (TVA),[40] and is one of the largest public power utilities in the nation.

Chattanooga's manufacturing economy suffered during the 1980s, resulting in population declines. The city has been experiencing a renaissance since 2000 and has been Tennessee's fastest growing community in the 21st century. Chattanooga redeveloped its waterfront to the tune of $120 million and built the Tennessee Aquarium to help revitalize downtown. The Lyndhurst Foundation has played a crucial role in Chattanooga's resurgence and continues to assist the community in promoting their impressive fiber optic network to businesses and entrepreneurs across the nation. The City, EPB, and the Lyndhurst Foundation have worked diligently to promote the network nationally; its fame is no accident and was not inevitable.

Map of Chattanooga and Service Area

Prior to fiber optics the Electric Power Board focused on electricity. Private companies own the city's natural gas and water utilities. The City made an unsuccessful attempt to buy the water utility in 1999, in an effort to reduce rates and promote economic development. RWE AG, the world's third-largest water holding company, subsequently purchased the utility, but the present Mayor, Ron Littlefield, has suggested he would still like to purchase it.

The Board governing EPB is comprised of five members, each serving a staggered five-year term. The Mayor nominates appointees subject to confirmation by the City Council.

EPB began investing in fiber optics in the late 1990s but did not commit to a fiber-to-the-home network until 2007. Comcast and AT&T are the incumbent cable and telephone providers. Prior to EPB's FTTH network, Comcast and AT&T tended to invest in Chattanooga upgrades after much of the rest of the country.

> EPB recognizes the rapidly advancing technological changes in telecommunications through fiber optic network facilities and has determined that the wisest use of its assets and existing distribution system is to construct a fiber optic network that has substantial excess capacity over EPB's present needs that will be available for a considerable time in the future. - *EPB Resolution 96-08, April 29, 1996*

First Steps

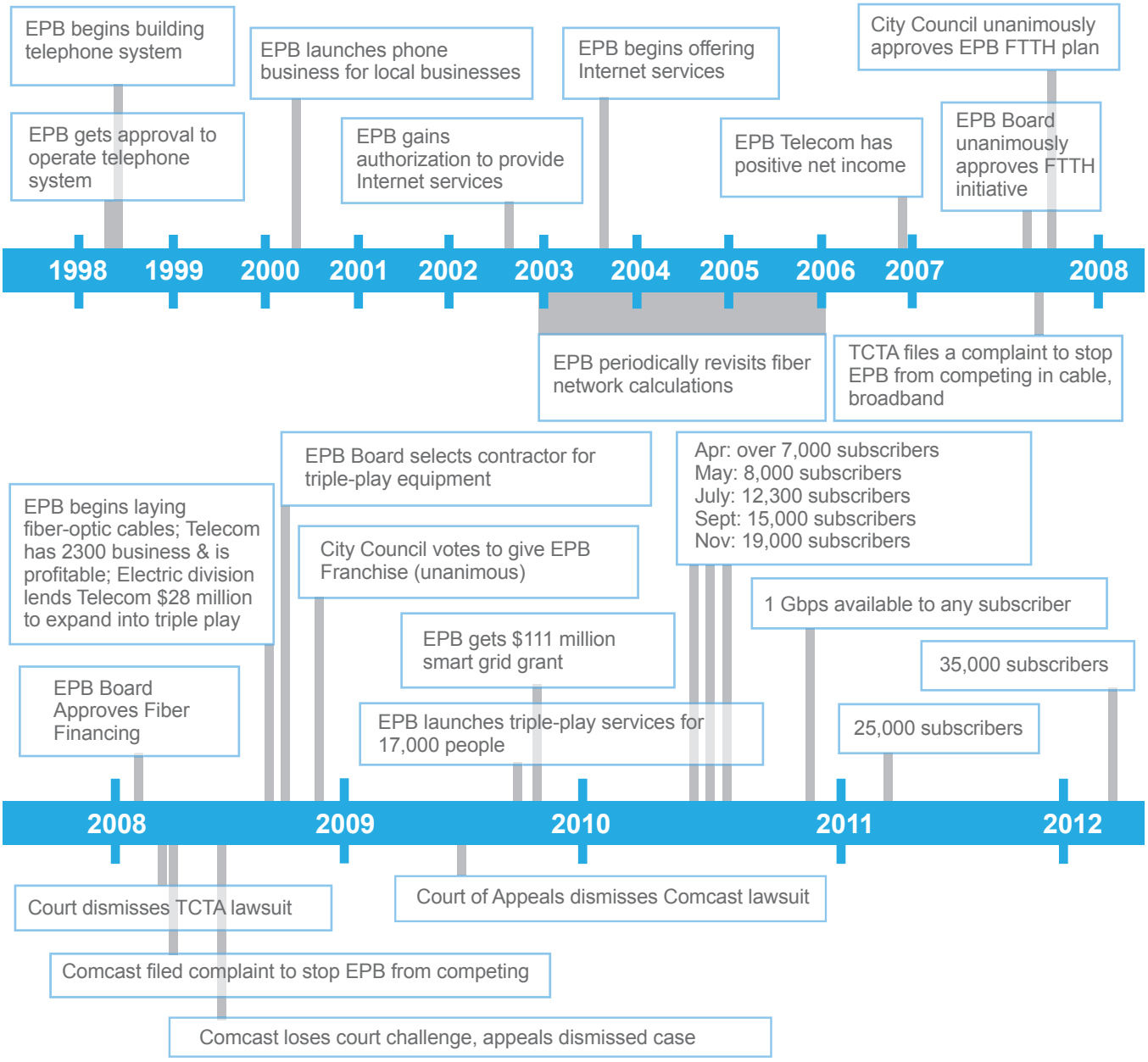
Like many utilities, EPB added fiber optics to connect its substations and recognized the growing importance of instant communications before passage of the 1996 Telecommunications Act. In April 1996, EPB's Board passed two resolutions authorizing construction of an "advanced intelligent distribution system" using fiber optic cables, and allocating $350,000 for the first segment of the network. Once it was passed, the Board began considering how their assets could benefit the community.

During the dot-com boom of the 1990s, EPB CEO Harold DePriest watched as the utility entertained potential partnerships with a number of private companies interested in expanding EPB's fiber optic rings to reach businesses and residents. Nothing ever resulted from the discussions. The utility hoped another provider would build the full fiber system, but the costs of building fiber-to-the-home, even with the benefit of EPB's existing network, proved too daunting for private companies worried about the return on investment.

In 1997, when Jon Kinsey took office as the new Mayor of Chattanooga, he privately confronted DePriest, challenging him to identify how EPB really benefited the community. DePriest recalls being really steamed as he left the meeting, but the discussion stuck with him. He had been with EPB for more than 25 years, starting as a line engineer in 1971. He *knew* the ways in which EPB did not live up to its historic mission, which included improving quality of life in the community. EPB had been uncooperative in projects with the municipal government, and the organization had become complacent. DePriest realized Kinsey was right—that "we ought to do more than just provide basic electric service." It got him thinking, "How can we contribute to the community?" EPB began a slow shift to being truly responsive to the people of Chattanooga. "And," says DePriest, "it turns out it is fun!"

DePriest believes public power companies should examine why they came into existence. The reason was not narrowly about electricity:

> I think we were created because this new technology was available and the people of Chattanooga needed some organization to master that technology for their benefit. In those days it was electric networks and motors and things like that. But as the technology changes, the same issues are there… if it fits that classification of eventually being a public utility, in the sense of something that everybody needs, then organizations like us have not just a right, but a responsibility to step up and provide that for our community.



EPB Fiber Timeline

As Harold DePriest was wrestling with EPB's mission in the digital era, the Tennessee Legislature was starting to allow the many municipal electric companies in Tennessee to offer telecom services, and also allowing inter-divisional loans from the electric funds to telecom divisions to finance the new investments.

EPB decided to take a small step by offering phone service to local businesses. Businesses tend to cluster, making the investment to serve them less than for residences. EPB received approval from the Tennessee Regulatory Authority (TRA) in March of 1999 and began building their telephone network a few weeks later. TVA, which had to sign off on any loans involving electric revenues, also approved the loan from the Electric division to the Telecom division. Less than a year later, a new standalone Telecom division was offering phone services. EPB decided to expand into broadband services and received approval to do so in July 2002. Another year passed before it officially began offering those connections.

Throughout this whole period, EPB was monitoring developments in communities like Tacoma, Washington (a large municipal cable network), UTOPIA (a wholesale only, FTTH network in 13 communities in Utah), and other Tennessee municipalities entering the telecommunications

business. Across the state, for example, the city of Jackson launched a large FTTH network using a wholesale-only approach for phone and Internet in 2004, only to switch to providing retail services in 2007.[41] EPB watched and learned, waiting to expand its efforts until equipment costs fell and it could draft a plan in which the numbers lined up. In the meantime, the Telecom division began generating positive net income around 2006.

The Telecom and Broadband divisions were essentially a standalone company that allowed EPB to learn the technology and the business side of telecom. As it considered moving forward, DePriest saw the potential to integrate the Telecommunications work with the rest of the utility. Being in a competitive business would raise EBP to a new level, forcing them to become more efficient and better at serving the community. In DePriest's words:

> It is tough, it is painful, and it is absolutely good for you. It's a little bit like any of us when we get out of shape and we have to start running… we don't like it but in the end we feel better.

EPB showed that the benefits of the smart grid would justify the expense of the fiber optic network even if the utility did not use it to offer telecom services.

Developing the Plan

In 2007, EPB finally felt the moment was right for fiber. It developed a 10-year plan to build a fiber optic network across its entire footprint. While other utilities have focused on remote meter-reading as their smart grid investment, Chattanooga decided to build a "Mensa grid," which would be much more intelligent. EPB would invest in a variety of sensors monitoring a variety of metrics and be able to instantly reroute power during storms or other disruptions. It would do remote meter readings far more frequently and share that data with ratepayers in real time. A major goal would know much more about the health of the grid and its constituent parts.

EPB showed that the benefits of the smart grid would justify the expense of the fiber optic network even if the utility did not use it to offer telecom services. At the same time, the projected cash flow from triple-play services was enough to justify building the network. In effect, the City would get a fiber optic network with two separate, equally viable sources of support.

Some questioned the purpose of such a substantial fiber optic investment when other utilities were using wireless approaches, but both the TVA and the Electric Power Research Institute (EPRI) vetted EPB's plan and found it valid.

In its plan, EPB argued that its topography made many wireless solutions impractical. The fiber optic network, an investment expected to last decades, would be less expensive and far more reliable than wireless over the long term. Their approach would put fiber optic connections through the entire territory but not directly connect to the meters. Instead, the new smart meters would connect to the fiber locally through wireless mesh networks. Utilizing the robust fiber optic network ensured the most reliable, fastest transmission of data. While such an approach might not have been considered cost effective solely for periodic meter readings, it made sense in the context of EPB's ambition to automate its grid. The cost of the mesh network was included in the Electric divisions' five-year budget and not included in the bonding.

Community Support

Before EPB could move forward with its vision, it had to seek community support. DePriest says that EPB started by identifying 23 community leaders spread across the government and business community and scheduled the first meeting with the person they believed most likely to oppose it. All were supportive. EPB then moved on to educate its own Board, focusing on products that would be delivered through the network and how they would benefit the community. The fiber team made sure the Board understood how fiber networks differed from older technologies like DSL and cable. Finally, the utility took the case to the public.

Even though it was already providing telecommunications services to local businesses, EPB had to complete a number of requirements under state law to add residential services. The Electric Power

Board approved the triple-play plan in August 2007 and filed it with the State Comptroller for comments, per Tennessee law (see box below). EPB also took its plan to the public, starting with a neutral phrase in the press release announcing the plan:

> EPB encourages Chattanooga area residents to voice either their support or opposition to this plan by contracting the Chattanooga City Council or members of EPB's Board of Directors.

Local elected officials were very supportive – they had plenty of time to consider what it would mean because DePriest and EPB staff made sure to keep elected officials and other local leaders in the loop as part of its "no surprises" policy. The last thing EPB wanted was for local leaders to be caught off guard by anything the public utility did – a real possibility given the misinformation regularly distributed by incumbent groups opposing community networks. By maintaining clear lines of communications, EPB ensured any misunderstandings could be quickly cleared up.

Steps of Approval for the FTTH Plan

- EPB Board approves plan on August 17, 2007
- Plan goes to Tennessee Comptroller
- EPB Board considers Comptroller comments and re-approves
- EPB Board schedules a period for public comments and publishes notice in the newspaper
- EPB Board votes third time on plan
- Chattanooga City Council approves with the required supermajority
- EPB develops plan for inter-division loan and Board approves
- City Council approves inter-division loan
- TVA approves the inter-division loan
- EPB Board approves bond issue
- City Council approves bond issue
- Chattanooga grants a franchise to EPB – November 11, 2008

Tennessee law requires a number of public meetings as part of the process in building a municipally owned network, but DePriest says they went far beyond what was required by law. He recalls,

> If you don't have the support of your public, your city council, why would you want to do it? We fashioned our campaign for close to a full year, saying if you want us to do it, we'll do it for you. If you don't, tell us now so we don't waste money.

Opponents often try to use the biggest number possible attached to a worst-case scenario, but EPB put it in context. EPB staff explained that the worst-case scenario was one in which not a single person or business subscribed to the network. If this happened, and EPB wasted every penny borrowed for the network, the average electric ratepayer would have to pay for it, at a cost increase of $2 to $3 per month.

Several senior EPB staff described the many public meetings they attended. EPB offered to give employees public speaking training and a choice among several PowerPoint presentations if they wanted to attend or speak at any community meetings. EPB Vice President of Corporate Communications Danna Bailey recalls EPB employees participating in hundreds of meetings, including one with a few people sitting in lawn chairs in a neighborhood cul-de-sac. In the first few months, EPB had to be very proactive. Utility employees made calls and followed-up, asking local organizations to allow EPB to address their meeting. As interest built, more organizations started reaching out to EPB, but it took time.

Communications with the community were about presenting a vision of a different kind of network. Bailey recalled the series of iconic car commercials asking if "you got a Hemi in there," before throwing her hands up in the air and saying "no one knows what a Hemi is!" Unlike Bristol's approach, EPB was not focused primarily on lowering rates. The utility emphasized three main benefits: modernizing the electric system (at a time before "smart grid" became a catch-phrase), economic development, and superior triple-play services. The larger point was that EPB was not

duplicating already-available services, it was investing for the future of the community.

In part because of EPB's tremendous positive image in the community, developed in the years since DePriest accepted Mayor Kinsey's challenge to put the community first, citizens overwhelmingly supported the fiber plans. Polls, including those commissioned by opponents, pegged public support between 80 and 90 percent.

EPB's Board voted once again to approve the plan after receiving comments from the State Comptroller. Under Tennessee law, EPB needed the approval of two-thirds of the Council but also had the power to call a public referendum on the question if it so chose. On September 27, 2007, the City Council gave unanimous support for the plan.

Incumbents Challenge EPB

One week before a fiber-related City Council vote, the state's cable trade group, Tennessee Cable Telecommunications Association (TCTA), began strategically filing court claims. On September 21, 2007, the TCTA filed a complaint alleging the Electric division would impermissibly cross-subsidize the Cable and Internet division, which was later renamed the Fiber Optics division). In the succeeding years, Comcast and TCTA would file lawsuits or submit new arguments in pending cases immediately before public votes on aspects of the network. Their goal seemed to be to disrupt and delay such votes by casting uncertainty on the project status. The tactic ultimately succeeded in stalling, but not stopping, the network.

Despite the lawsuit, EPB began developing its financing plan for its network. In preparation for offering triple-play services, the Fiber Optics division had to borrow sufficient funds to connect each subscriber's premises to the Electric division's fiber optic network. The Electric division uses a rate allocation model approved by the TVA (and originally used by AT&T in allocating costs across its divisions) to charge the Fiber Optics division for use of the core fiber network. As EPB told TVA,

> EPB will allocate annual operating costs on a usage based method that allocates costs among its various Divisions according to the number of customers of each Division that receive services over the fiber optic network.

The Community Loves EPB Fiber

By February, the Fiber Optics division submitted its financing plan, which was approved by the EPB Board. The original plan for the network involved two bond offerings for a total of $220 million, one for the electric side and another for the Fiber Optics division. The tumultuous bond market led them to instead make only bond offering for the electrical side. The breakdown of the financing was $162 million to build the fiber optic network (which would be owned by the Electric division), $39 million for electric equipment such as transformers, $26 million to cover the first three years of interest payments, and the remainder to cover the financing charges. The 25-year bond carried a 4.5 percent interest rate.

EPB's Electric division would provide a loan of no more than $60 million to finance the Fiber Optics division startup costs. State law prescribed the interest to ensure no cross-subsidization. That inter-division loan and the cost allocation mechanism for ensuring all divisions paid their fair share of costs had to be approved by the EPB Board and by TVA, which vehemently opposes any use of electric revenues cross-subsidizing any other service.

The bond issuance was completed before the court cases surrounding the triple-play services were settled, and the official statement clearly stated that the plan for the smart grid would proceed regardless of whether EPB began providing triple-play services. It also clearly states that the bond is backed solely by the utility – the City's "full faith and credit" is explicitly not pledged. TCTA's spokesperson Stacey Briggs regularly took public shots at EPB, saying on one occasion, "It's an enormous debt for the electric system to take on. If they have this money, the consumer should be concerned why electric rates aren't lower."[42]

> "We've won four court challenges and there is simply no evidence – and any reason why – we would use electric revenues for this service." – *EPB CEO Harold DePriest*

In an interesting contrast, while EPB was investing in a $200 million fiber optic network for Chattanooga (the fourth-largest city in Tennessee) and the immediate surrounding area, AT&T was pushing the Legislature to amend video franchise laws in return for AT&T promising to invest $400 million in the entire state.

In the middle of April, the court dismissed the TCTA lawsuit against EPB. One week later, Comcast filed its own lawsuit in a different court using the same basic cross-subsidization arguments as the TCTA case. TCTA then appealed its case, but the Court of Appeals affirmed the lower court's dismissal. Comcast's lawsuit and subsequent appeal shared a similar fate. In response to the central premise of the lawsuits (i.e., that EPB would eventually violate the law by subsidizing the broadband division with electricity revenues), the Hamilton District Court explained, "It would be inconsequential for this court to order EPB to follow the law. EPB is already under a duty to follow the law."

Table 5: Estimated Fiber Network Usage

Service	Year 1	Year 2	Year 3
Video	3,130 (9.53%)	18,071 (25.29%)	42,361 (19.37%)
Internet	2,222 (6.77%)	12,828 (18.31%)	30,070 (13.75%)
Phone	1,541 (4.69%)	8,895 (12.7%)	20,851 (9.53%)
Electric	25,949 (79.01%)	30,274 (43.21%)	125,422 (57.35%)
Total	32,842	70,069	218.705

In developing its rate allocation model, EPB forecast the above take rates for each service. Electric uses are the main service of the network.

The lawsuits were successful in slowing the triple-play project, which was a victory for network opponents in itself. Comcast had extra time to get small businesses locked into long-term contracts and to invest $15 million[43] in the area to launch its "Xfinity" services (which include a robust video-on-demand catalog and faster Internet access packages) to Chattanooga even before Atlanta had access to it. This was likely the first time Chattanooga was ever prioritized over Atlanta for such upgrades, and it happened as a direct response to the threat of competition.

EPB's Director of Fiber Technology Colman Keane believes that EPB may have lost 10 percent of the market they would have had if not for the one-year

delay from lawsuits. EPB has had to work harder to make up that gap.

While the cases moved through the court system, Comcast and the TCTA went on an advertising blitz. Some 2,600 television ads urged citizens to tell elected officials to oppose the plan, and compared Chattanooga's plan to a sinking wholesale broadband project in Memphis called Networx.[44] The incumbents set up a website called "They Fail, We Pay" as part of the campaign. Harold DePriest said the ads led to just 38 calls to City Hall, with half favoring the network. The ads may have actually backfired, as noted by Chattanooga City Council member Jack Benson:

> I got more calls from citizens who were upset and mad because they thought the money that was being spent on these ads was coming from Comcast's rate increase this year ... Most people I've talked with want some competition for Comcast and they like what EPB is trying to do.[45]

Comcast has used similar ad campaigns with much greater success in other communities, but they fell on deaf ears in Chattanooga. Danna Bailey summarized it, "If there are two stories being told, the one with more credibility wins." EPB's studies indicated that its credibility was extraordinarily high in the community, and Comcast's was extraordinarily low.

Comcast claimed that a publicly owned fiber optic network was unnecessary because the company could "meet the telecom needs of Chattanooga."[46] In Comcast's vision, Chattanooga's telecom needs did not include building the first citywide 1Gbps network in the U.S., even though that network ultimately drew national media attention and attracted new businesses and entrepreneurs to Chattanooga.

As EPB promised in the bond issue, it proceeded with building the fiber optic network for the Electric division despite legal wrangling throughout the summer of 2008. By the end of summer, the lawsuits had all been dismissed, EPB had selected its main contractor for the network, and the Telecom division had generated $1.3 million in net income from serving 2,300 businesses with phone and Internet services. The Fiber Optics division, which would eventually encompass all the communication services, borrowed $28 million of the budgeted $60 million from the Electric division. In November, the Chattanooga City Council and EPB agreed to a franchise agreement – the same agreement used for Comcast's services, with the same franchise fee.

> "The initiative for EPB provides our community leverage against the growing oligopolies of big entertainment and telecommunications and ultimately serves its founding charter to provide "power" to the people. Consequently, if EPB wins, we gain." – *Nick Bosco in Times Free Press Op-Ed*

Launching the Network

On September 15, 2009, Chattanooga announced that it was officially starting to offer its triple-play services. At that time, 17,000 households had the option of subscribing. In the middle of October, when another 10,000 households were able to subscribe, EPB delivered stunning news: it had just received a $111 million grant from the Department of Energy to rapidly roll out its smart grid. The grant allowed EPB to complete its 10-year deployment plan in less than three years.

> "We're entering the market with a consistent and clear price – it is not a temporary, promotional price." – *Katie Espeseth, VP of EPB Fiber Optics*

At the beginning of 2010, EPB announced the first 100Mbps symmetrical package available in the community, making Chattanooga one of very few communities to have that option citywide (the others were mostly community fiber networks, as well). Though some cable companies in the nation were advertising 100Mbps download speeds, they offered much slower upload speeds. Such asymmetric arrangements can be fine for video-on-demand, but it is severely limiting for activities such as working from home.

By late spring 2010, some 100,000 households could take service and 8,500 had already signed up. As the summer heat crept in, Chattanooga increased the

highest capacity package to 150Mbps symmetric. As a responsible electric company, they also noted that they were using an Energy Star compliant set-top box, unlike their main competitor.

One year after introducing the only 100 percent fiber optic network in Chattanooga, EPB made a stunning statement, covered by the *New York Times*: Chattanooga would be the first U.S. community, and one of only a few on the planet, with 1Gbps service available anywhere in the community. The connection came at $350/month – a bargain compared with gigabit circuits anywhere else in America. Though Google kicked off the nation's fascination with the 1Gbps citywide connection, Chattanooga delivered before Google had picked a location.

> EPB credits the smart grid automation with preventing 2.4 million customer minutes of interrupted service during the 2011 tornadoes.

By April 2011, EPB was serving over 25,000 residential subscribers. This was 18 months into the business plan that called for signing up 50,000 in three years, which meant EPB was on track despite setbacks related to the legal challenges. They also had 2,500 business customers. And by late February 2012, they announced the 35,000th customer.

Revenues are considerably beyond expectations. In some months they operate in the black. In months with particularly high numbers of new subscribers, the capital investment pushes them into the red. To date, EPB has borrowed approximately $50 million from the electric department to finance start-up costs. EPB is presently on track to back its debt ahead of schedule.[47]

EPB is cost-competitive with its chief competitor, Comcast, but anecdotal evidence suggest its value is considerably higher. An article in the *Chattanoogan*

Table 6: Comparing EPB Fiber, AT&T, and Comcast in Early 2012

EPB Fiber	EPB Price	AT&T	AT&T Price	Comcast	Comcast Price
Cable Television Offerings					
Bronze Basic	$11.99	U-Basic	$19.99	Basic	$13.99
Silver 80	$54.99	U-Family	$59.00	Starter 80	$56.95
Gold 194	$65.99	U200	$72.00	Preferred 160	$76.90
		U300	$87.00	Premier 200	$100.99
		U450	$119.00		
Internet Offerings (Mbps Downstream / Upstream)					
30/30	$57.99	3/1	$38.00	1.5/.384	$39.95
50/50	$69.99	6/1	$43.00	15/2	$56.95
100/100	$139.99	12/1.5	$45.00	20/3	$62.95
1000/1000	$349.99	18/1.5	$55.00	50/5	$116.95
		24/3	$65.00	105/10	$199.95
Phone Offerings					
Basic (w/ features)	$22.99	Local	$18.50	Local (w/features)	$34.95
Adv. 120 long distance	$29.99	Local (w/ features)	$28.00	Unlimited long distance	$44.95

discusses some problems residents have had with Comcast customer support that led them to take services from EPB. One reaction:

> Comcast came by recently to offer us a "substantial savings" if we'd make the switch back to them. My question was, why now? I was a customer for years and treated poorly as rates increased exponentially. Now they offer the discount? No thanks.
>
> For the $5 extra per month that we pay for EPB, we receive better features, prompt and polite customer service, and an all around trouble free experience. Thanks EPB![48]

While responding to an incident in a park, first responders can flood the area with enough light to make midnight seem like midday.

Given EPB's success, some were surprised by the downgrading of EPB's bond rating by Fitch from AA+ to AA. The official response from EPB, however, showed no surprise:

> "It seems counterintuitive, but this is a result of something positive: our conscious decision to expand our business into communications for the good of the community," President and CEO Harold DePriest said. "We're not the typical utility company, so it makes sense that we wouldn't be rated like one."

EPB long ago recognized that offering telecommunications services would be riskier than just providing electricity but believed diversifying would create benefits for the community as a whole. In practical terms, the downgrade should have no effect. EPB's debt remains investment grade and many of the bond investors that will buy future EPB bonds do not distinguish between AA+ and AA risk.

Municipal Usage

The city of Chattanooga has used the fiber optic network as a foundation for its own wireless network. Prior to EPB's Fiber plan, Chattanooga Director of Information Services Mark Keil had been developing plans for a fiber optic network that would support core city functions. EPB's announcement allowed him to shelve his wired plans and instead focus on building wireless capacity on top of the network. When asked about the value of EPB owning the network, he replied that Chattanooga "cannot afford any other vendor." [49] According to Keil, the value of EPB lies not just in the price for connectivity, but its general willingness to work with the city on projects.

In the summer of 2011, with the aid of $5 million in federal and state grants, the city of Chattanooga began building a Wi-Fi network using EPB's fiber for backhaul. Being able to attach wireless access points directly to a fiber network greatly improves network performance. The network is used for many government purposes, including public safety and intelligent traffic systems. Downtown traffic signals are coordinated and respond to changes in traffic conditions.

Mark Keil explained that money spent on traffic infrastructure created access points that could be used for other services as well, such as public safety. The City wants to avoid building silos, preferring to create a common infrastructure over which new services can innovate.

Chattanooga is pioneering an installation of smart LED street lights created by a firm located in town, Global Green Lighting. Not only are they more energy efficient, they are connected via a wireless network that allows them to report a variety of metrics and to be controlled remotely. These lights can be a boon for public safety because police officers can increase light output as necessary on a granular basis. While responding to an incident in a park, first responders can flood the area with enough light to make midnight seem like midday. The lights can also be flashed in a pattern, directing motorists along a specific route.

Before committing to the new technology, the City placed the poles in and around a park as a pilot project. Changing from the conventional lights to LED created an energy savings of 50 percent. However, the total energy savings from the pilot was 82 percent—the

EPB Installs a lot of Fiber

extra 32 percent resulted from efficiencies created by remote management. One such benefit is that lights can be easily programmed to dim at certain times based on local need. Between the LED technology and remote reporting capability, the maintenance cost of these lights is lower than present technology.

Chattanooga plans to replace all of its older lights with the new LED smart lights over the next two years. The lower operating expenses and energy savings for the lights will pay for their replacement and result in more than $1 million in savings every year after 2018.

The City is considering other applications, such as free Wi-Fi in some areas. But “free” Wi-Fi incurs fees that someone has to ultimately pay and local leaders not sure taxpayers are willing to foot the bill for free Wi-Fi in parks. In some cases, the City may partner with local businesses or institutions to ensure free Wi-Fi is available, but they have no plans to blanket the community with the service.

Culture Shift

EPB’s ‘Mission Statement’ is to “Enhance the quality of life in our community by providing energy, communications, and related services courteously, reliably, and efficiently at the lowest reasonable cost.”

Employees widely agree that EPB was not entirely meeting its mission prior to Mayor Kinsey’s challenge to EPB CEO Harold DePriest in 1997. That conversation began a long process of change that started from the top with DePriest. EPB became a conscientious partner, working with the local government to ensure projects were completed on time and at reasonable rates. DePriest implemented productivity measures for performance reviews and rewarded that performance over seniority.

As part of its culture shift, the “Electric Power Board” became “EPB,” signifying its intent to do more for the community than just provide electric power. Harold carefully led EPB along this transformational path,

creating a guiding document entitled "Professional Power" that has been coupled with training sessions to reinforce a culture that puts customers first. Recognizing the symbolism of a clean environment, EPB began having its floors regularly polished and trucks regularly cleaned.

EPB developed higher expectations of respect among all employees as it worked to increase communication with the goal of information flowing freely across all aspects of the utility. Along the way, a few of the senior staff chose to leave rather than continue under the new approach. DePriest noted that although EPB's overall staff declined from 470 to 350, they answered calls more quickly. In fact, every productivity measure increased – something DePriest attributed to EPB offering more meaningful work to its employees.

EPB employees show undeniable pride in being a part of the utility. A national study found that among the largest 78 utilities in the U.S., EPB had the second-best customer service rating from ratepayers.

An example of EPB's present customer-centric approach was the choice to credit telecom subscribers for the time they lost due to outages during the disastrous series of tornados that devastated the region during spring 2011, and again for those who were affected by severe storms that rocked the region on Labor Day in 2011. Kathy Burns, Vice President of Customer Relations, said, "That is pretty much unheard of in the communications industry … but it was the *right* thing do." According to Mike Kaiser, assistant Vice President of Finance, they were thinking about it from the customer's standpoint, not EPB's standpoint. "From a financial standpoint, it wasn't a good decision," he added with a laugh.

EPB credits the smart grid automation with preventing 2.4 million customer minutes of interrupted service during the 2011 tornadoes alone.

The ensuing discussion clarified that it *was* the right financial decision from a long-term perspective even if it compromised short-term cash flow. When Comcast customers notified Comcast that EPB customers were getting credit for outages, Comcast said they did not have a similar policy, which generated tremendous positive attention for EPB's network. Kathy Burns summed it up, "If you don't have that mindset as a utility of what is the right thing to do for your customers, don't think about trying to do this."

EPB started with Telecom as essentially a separate company. Other municipal networks have chosen to keep the telecom and pay-television ventures separate for strategic (e.g., Tacoma, Wash.) and legal (e.g., Lafayette, La.) reasons. But EPB wanted to integrate its utility. EPB deliberately integrated the Fiber Optics division into the full utility when it entered the triple-play business because it wanted an integrated utility.

The integrated approach puts more pressure on employees to know what is happening across all parts of the utility. Customer service representatives must be well trained to handle the competitive services, but they use the same skills when dealing with the monopoly services. Their competence creates a more positive image of the utility as a whole. Indeed, anyone representing the utility is under similar pressure to perform with competence and professionalism because the utility now has customers who have a choice and can take their business elsewhere.

Smart Grid

According to the Lawrence Berkeley National Laboratory, electric interruptions and outages cost the economy $80 billion each year, with most of the those losses born by the commercial sector.[50] Keeping the lights on literally keeps money in the economy, which is why electric utilities have invested in

communications networks to improve the reliability of their electrical services.

While other electric utilities have made smart meters the basis of their smart grid investments, EPB is building the most automated smart grid in the country.[51] EPB's investment in smart switches is what most differentiates its approach from that of other utilities. The utility is installing 1500 smart switches at an average of 150 premises apart, most of which are IntelliRupters. If parts of the grid suddenly go down, IntelliRupters minimize the number of affected meters. When a tree fell on a distribution line in April 2011, two IntelliRupters sensed the problem and isolated it, keeping the lights on at U.S. Xpress Enterprises' Chattanooga headquarters. U.S. Xpress (and an additional 1,200 customers) would have been in the dark for at least two hours, which would be a problem for the facility that oversees America's third-largest private truckload carrier (8,000 trucks; 22,000 trailers).

EPB credits the smart grid automation with preventing 2.4 million customer minutes of interrupted service during the 2011 tornadoes alone. As of Feb 29, EPB reported that its fiber network had saved 5 million customer minutes interrupted since July 1, 2011—an average of 30 minutes per customer.

EPB's investments have allowed some of their customers to forego paying EPB to build redundant electrical feeds to connect their facilities because the IntelliRupters significantly lower their window of exposure. One company reported to Diana Bullock, EPB's VP of Economic Development and Government Relations, that they could forego $488,000 of expenses by establishing their operation in Chattanooga due to the EPB smart grid.

Though its abundance of smart switches are what makes it unique, EPB has also invested in smart meters that reduce the need to roll a truck to solve a remote problem. Ryan Keel, Assistant VP of the Electric System, explained that with only half the smart grid investment deployed, EPB already saw considerable savings during the unprecedented string of tornados across the EPB footprint in spring 2011.

During major storms, smart meters reduce confusion and increase efficiency. Prior to installing the smart meters, EPB would have to send a truck to investigate outage reports which may have already been resolved,

EPB Fiber Van

each of which takes an hour on average. Now the meter on the customer's home can tell them if it is receiving power. From data gathered during the storms and their aftermath, EPB learned that its network prevented 200 dry runs for the tornadoes and another 140 during harsh Labor Day storms. With two people per truck, this represents 680 hours of savings for the electrical division—time that was spent resolving actual outages more quickly.

EPB can remotely connect and disconnect meters. This benefit goes beyond fewer truck rolls, as drivers will not have to worry about confrontations on customer premises, particularly in the event of a disconnect for nonpayment. When the reason for disconnection is remedied, EPB can restore service immediately.

EPB is adding so many real-time reports from so many devices that they have had to develop a new database and software to manage the complexity. They will soon have approximately 170,000 devices that will each report data every 15 minutes, creating over 16 million data points each day. Half the smart meters were in place by the end of 2011, with the rest scheduled for installation in 2012.

This level of data collection creates a wealth of information that can be used to increase efficiency. For example, the utility may be able to shave 20 to 30MW off its peak electrical load because it knows exactly what the voltage is at the last house down the line of every distribution run. Many Chattanooga homes use electric heat as a backup to their primary method of heating the home. Previously, home-owners would only realize they had a heating problem after they received a much-larger-than-expected bill from EPB. With the new meters, EPB can proactively contact people if

there is an abnormal spike in activity, saving money for the homeowner. And EPB also saves by avoiding added distribution costs. Long-term, the network allows EPB to better gauge the performance and reliability of key grid components, allowing EPB to be smarter in replacing them when needed.

In a similar vein, the new meters allow EPB to detect electricity theft and attempts at it. Theft is a much more serious problem than most realize and reducing it will result in a healthier Electric division from a financial perspective, benefiting the community.

EPB estimates the smart grid investments will generate $300 million of economic benefit to the community over 10 years. If the 2011 storms are any indication of changing weather patterns, those savings could well be even higher over the long term. In evaluating EPB's figures, the Electric Power Research Institute repeatedly came to the following conclusion for the various estimates: "CEPB's stated value for this benefit appears to be hard, reasonable, and perhaps a little low." Evaluating the expectations is difficult because Chattanooga's EPB is breaking new ground, but the benefits are already starting to rapidly accrue.

As EPB improves the reliability of its grid, everyone will benefit—even if they do not realize it. These savings justified the fiber optic network even before the federal grant allowed EPB to expedite the build-out.

Network Benefits

According to a study published in the *Journal of Applied Business Research*, the network could generate at least $350 million of social benefits and over 2,600 jobs over the first 10 years from triple-play services in Hamilton County alone. Using a regional input-output economic model, the study expected a next-generation network would generate 683 jobs directly, and almost 2,000 more indirectly (from multiplier effects). The $350 million in social benefits largely results from increased tax receipts from job growth. The figure does not include community savings from lower-priced telecom services resulting from increased competition. In a speech in 2011, Harold DePriest noted that the study was later updated and predicted 3,600 jobs and more than $580 million in economic value over the first 10 years.

EPB's communications services paid over $1 million to Chattanooga via Payments in Lieu of Taxes, in fiscal year 2011 and is on schedule to pay more in 2012.

The smart grid investments enabled by the network were expected to generate at least $300 million in savings from reduced outages. This figure includes the costs of outages for business and industry, and also from reduced numbers of truck rolls for EPB.

These anticipated benefits together total three times the value of the investment in the network in the first 10 years alone. Yet, as Colman Keane, Director of Fiber Technology, put it: "A lot of the benefits we see from our system don't accrue to EPB." Lower prices for telecommunications services mean more money in household and business budgets; reduced outage minutes mean improved productivity; and new jobs and business expansions mean increased tax revenue for local governments. Each of these benefits to the community results in no direct benefit to the network owner, which is why private companies like Comcast and AT&T have less incentive to invest at the level EPB chose to. But EPB's mission allows it to incorporate indirect benefits to the community when evaluating its return on investment.

Chattanooga schools now have at least 100Mbps connections and the local government has high-capacity connections from its offices to wireless access points that serve a state-of-the-art traffic management system they have deployed. A major cell phone provider uses EPB Fiber Optics to connect its towers, allowing it to offer 4G services in the community.

EPB Fiber Television

EPB's Chief Network Architect, Larry Hinds, testifies to the superiority of EPB fiber over cable for working remotely. He often had problems working over his home cable connection because remote applications software requires a robust connection both downstream and upstream. Cable companies advertise speeds of "up to" *X*Mbps because connections are shared, and local network congestion can seriously compromise the quality of service. After his home was connected to EPB's fiber, he found little difference between productivity at home and in the office.

EPB is already renovating one of its buildings to increase its capacity for co-location services (where customers store servers in cages on EPB premises), which have been more popular than expected. When local online startup Retickr learned its product would soon be featured on the very popular website Lifehacker they were not prepared for the onslaught of traffic to its site. EPB helped Retickr to customize a solution that fit their needs, going above and beyond what was expected of a service provider. Other startups use cloud services, like Amazon's Elastic Compute Cloud (EC2), to scale when launching products. The upfront cost of everything this startup had to buy to take advantage of EPB's facility on an ongoing basis would have bought Retickr just one month of EC2 services. EPB dramatically lowered its cost and reassured founders that they had made the right choice to locate in Chattanooga.

> HomeServe, a provider of emergency home repair service nationwide, was doing a site visit while scouting locations for a new call center. When the CEO was told the basic residential Internet connection on the network was 30Mbps, he asked his staff, "What does that mean?" They told him it was higher capacity than they could get in their current headquarters

Gamers absolutely love the network – the slowest Internet package available (30Mbps) has higher capacity than the best residential connections available in most communities. Chattanooga is trying to entice gamer conventions and encourages the industry to use Chattanooga as a test bed for future games.

When EPB considered instituting a monthly transfer cap for commercial subscribers, national anti-bandwidth cap activists Phillip Dampier and Jay Ovittore asked for and received a meeting with Harold DePriest. The two had long campaigned against such policies, writing regularly at StoptheCap.com. Together, they worked out a solution to protect EPB's business model while not instituting the hard cap commonly found on residential services from major cable and DSL providers. In short, if a user approaches a certain level of bandwidth consumption, EPB may start a conversation to learn what the users' needs are and, if appropriate, encourage a higher tier of service more appropriate to heavy usage.

For those who feared that EPB's Cadillac network would be subsidized by the Electric division, the numbers should reassure them. By the end of fiscal year 2011, the Fiber Optics division was effectively subsidizing the Electric division. As discussed above, EPB planned to build the fiber optic network whether or not it offered communications services to the public. The Fiber Optics division has so far paid some $5 million in rent to the Electric division for use of the network and EPB buildings, revenue that would not exist without the communications services. People like Danna Bailey would still work for EPB without a Fiber Optics division; allocating those salaries between multiple divisions has saved the Electric division $9 million thus far. The interest rate charged on the loan to the Fiber Optics division has yielded $2.7 million in additional return when compared to investing the same funds in U.S. Treasuries.

The net benefit of the fiber optic network to the Electric division is already over $16.8 million, a number that will grow more rapidly the more residents and businesses subscribe. To put it another way, the cumulative benefit of the fiber optic network means lower rates for ratepayers. EPB increased its electric rates by 5 percent in 2011, partly to restore reserves depleted by the costs of recovering from the unprecedented tornadoes.[52] While warning that another set of extremely severe storms could cause another rate increase, Harold DePriest noted, "Without revenues from the utility's telecom, TV, and video divisions, the rate hike would be at least twice as much."[53]

Additionally, EPB's communications services paid over $1 million to Chattanooga via Payments in Lieu of

Taxes, in fiscal year 2011 and is on schedule to pay more in 2012. These payments will also continue to increase as EPBFi's subscriber base increases.

State law precludes EPB from expanding its services to nearby communities that are outside its electric territory, or even just to specified economic development zones. But the incumbent providers spend a lot of time at the capitol to ensure Chattanooga's advantages are not shared any other communities. For years, the Tennessee Fiber Optic Communities, an organization of municipal broadband networks, have urged the state legislature to allow them to offer services outside their electric territories when invited, but AT&T and Comcast lobbyists have successfully killed the bills in committee. While it is difficult for EPB, or any public entity, to justify more than one lobbyist, AT&T had already registered 26 lobbyists for the 2012 session by October 2011.

The Lamp Post building has a bright, shiny layout with internal glass walls that can barely contain the frenetic energy and enthusiasm of those working within it. These are people who came to Chattanooga to launch the next big thing.

Other communities might be tempted to hoard these connections, ensuring more economic development for themselves. Chattanooga's willingness to expand in its region is a testament to its public-focus. Nonetheless, people in nearby cities appear to be getting jealous of the Chattanooga network. A Knoxville news station found a local firm, Claris Networks, expanding its operations in Chattanooga:

> "Connectivity for us is about eight to 10 times cheaper in Chattanooga than it is in Knoxville and other cities," said Dan Thompson, manager of advanced infrastructure service and product development for Claris. "We see a great potential for growth in Chattanooga."[54]

The announcement of the 1Gbps capacity may have caught the attention of Amazon, which was looking for a distribution center location nearby. It chose Chattanooga, bringing in 1,400 full-time employees with potential for another 2,000 seasonal jobs. In January 2012, Amazon reported it was employing over 2,000 workers there and announced an expansion that would add hundreds of new jobs.

Volkswagen was already committed to a significant investment in Chattanooga for a variety of reasons, but they quickly signed up for EPB Fiber Services in their downtown office and have since increased their investment.

HomeServe, a provider of emergency home repair service nationwide, was doing a site visit while scouting locations for a new call center. When the CEO was told the basic residential Internet connection on the network was 30Mbps, he asked his staff, "What does that mean?" They told him it was higher capacity than they could get in their current headquarters in Miami. Homeserve picked Chattanooga.

Among larger businesses that pay attention to site-selection magazines and work with local chambers of commerce, Chattanooga has caught on in a big way. The Chattanooga Chamber of Commerce reports that it is seeing more interest in Chattanooga than they have seen in 29 years. In January 2011, *Business Facilities Magazine* ranked Chattanooga as the top U.S. metropolitan area for economic growth potential.

Attracting Entrepreneurs

Chattanooga's approach does not rely on bringing in outsiders or massive companies to invest. EPB caters to the whole community, not just a few big employers. This is a key point for communities who aren't likely to attract companies the size of Volkswagen. EPB Fiber Optics allows small startups like Retickr to compete globally at affordable rates, and allows individuals to pursue dreams of starting sole proprietorships from their homes. Economic development is increasingly about a high quality of life and creating opportunities for businesses to succeed, which is what drives EPB.

Entrepreneurs are flocking to Chattanooga, partly because Chattanooga has reached out to them, developing incubator sites where they can learn from other successful entrepreneurs. EPB's fiber network

has energized the local tech community. A new venture capital firm, Lamp Post, depends heavily on the fiber network as it helps young companies build their businesses. The Lamp Post building has a bright, shiny layout with internal glass walls that can barely contain the frenetic energy and enthusiasm of those working within it. These are people who came to Chattanooga to launch the next big thing. Lamp Post is credited with assisting in the creation of 50 new jobs in the last half of 2011 alone.

There are periodic prizes for entrepreneurs who develop innovative applications. The most recent "48Hour Launch" occurred in November 2011, ending with more than 20 presentations to a crowd of over 100 people. At stake was $30,000 in prizes as enthusiastic techies and entrepreneurs rapidly developed applications and ideas – some new, and some that just needed 48 straight hours of intense concentration to finally go public. These events are hosted by "The Company Lab," a public-private partnership aimed at increasing the viability of start-ups in the Chattanooga region.

More impressively, The "Gig City" had a *geek hunt* for a summer 2012 program called the *Gig Tank*. If you were the first to tag a geek who was accepted into the Gig Tank, you received $1,000. As for the geeks:

> These students and entrepreneurs will come to the Gig Tank: a summer program that is part accelerator, part think tank, where the best gigabit ideas and businesses will not only have access to Chattanooga's network for development and testing, but also seed money, mentors, and the opportunity to win Gig Prizes of up to $300,000 in cash and seed capital.

The Gig Tank will last 14 weeks, culminating in a $100,000 award for the most viable business to emerge as well as a $50,000 prize for the "smartest and most disruptive student idea." All of the best ideas will have the opportunity to pitch to venture capitalists and angel investors. However, any ideas premised upon tens of millions of Americans having next-generation connections will have to wait for much of the U.S. to catch up to Chattanooga.

Analysis

The three case studies do not, of course, cover the universe of variations among publicly owned networks. There are, however, widely applicable lessons that can be drawn from their experiences.

Public Ownership

Each of these communities recognized the importance of the public having an ownership stake in the assets that make up the core of the economy. Chattanooga's EPB CEO Harold DePriest sums it up: "The issue is, does our community control our own fate, or does someone else control it?"[55] Concerns about quality of life, economic development, and rising telecommunications costs motivated them to question if it was in their best interests to accept the private companies' investments as adequate. As Lafayette City-Parish President Joey Durel likes to say, "We just wanted something better."

Each of these networks is part of a public power utility, as is true for most publicly owned broadband networks in the U.S. There are several reasons why public power communities have been willing to make the leap to broadband networks. First, and perhaps most importantly, the history of consistently providing reliable power at reasonable prices gives a city experience and confidence that it can deliver essential services successfully. Often it has a reservoir of goodwill with all kinds of customers because of its service, which distinguishes it from big cable and telephone companies that consistently rate at the bottom of customer satisfaction surveys.[56]

Second, public utilities can be their own anchor tenants, since broadband networks can be used to improve the efficiency of electricity networks. Because they typically keep prices low, they can usually count on other public entities as customers also.

Third, electric and broadband networks have many overlaps in expertise and equipment needs, from customer service to poles, conduit, ducts, bucket trucks, and experience in the right-of-way. Finally, a public utility can issue bonds to finance capital investments in a network.

Publicly owned entities also have different motivations than traditional cable and phone companies. Private sector companies invest in, govern, and set prices for their networks based on what creates the highest short-term profits. Community networks have to cover their costs and meet obligations to stakeholders while also balancing a variety of priorities that promote the public good.

Municipal electric utilities have their drawbacks. Electric utilities are used to operating as monopolies in an industry that changes slowly. Broadband networks present new challenges. Fiber optic technology itself changes rather slowly and the necessary upgrades are typically budgeted years in advance. Services, on the other hand, change more rapidly. Publicly owned networks compete with private companies with many times the resources and capacity as the community. Community networks that were slow to add video-on-demand, HD, or DVR options lost subscribers to rivals.

> The big cable companies have refused to overbuild each other; Time Warner Cable has no interest in going head to head with Comcast. The largest telephone companies, AT&T and Verizon, have ceased their investments in next-generation wired networks to focus on higher returns from wireless investments.

Success as a publicly owned network requires an entrepreneurial and nimble staff. Bristol and Chattanooga dealt with this by melding the electric and broadband divisions so that customer service had to become fluent in both. Employees from both BVU Authority and EPB reported that all the utilities' services have improved since offering broadband to the public.

Precipitating Factors

It should be understood that public entities are doing what the private entities have largely refused to do: overbuild existing networks. Most Americans have a choice between a single cable provider and a single DSL provider.[57] The big cable companies have refused to compete with each other each other; Time Warner Cable has no interest in going head to head with Comcast. The largest telephone companies, AT&T and

Verizon, have ceased their investments in next-generation wired networks to focus on higher returns from wireless investments.

In some areas, smaller private providers are thriving, but there is little prospect of rapid growth beyond these niche markets. The cost of adding capacity to cable networks is far less than doing so with DSL, creating what Harvard Law Professor Susan Crawford has termed a "looming monopoly."[58] Cable networks are increasingly the only option for high-performance access to the Internet in many communities.[59] Wireless remains a complement to wired services, and technical limitations mean wireless will likely never be a reliable substitute for high-capacity wired connections.

This uncompetitive dynamic is the major driving force for public investments in broadband. In the absence of any real threat to its dominance in Chattanooga, for example, Comcast had little incentive to invest in its antiquated network until EPB announced the fiber optic project. As a businessman, Joey Durel understood that an FTTH investment in Lafayette did not make sense for BellSouth or Cox. But as City-Parish President, he also understood that universal access to fast, affordable, and reliable broadband was essential for the community's future.

One of the most frequently repeated claims by incumbents is that any community network would be redundant because they already offer the connections the community needs.. But a next-generation fiber optic network far outstrips a cable or DSL one. Community fiber networks are no more redundant than interstate highways being built over dirt roads.

For example, in 2011 Chattanooga's *Times Free Press* reported, "while AT&T doesn't heavily advertise it, the company also offers gigabit service."[60] But AT&T charges over $10,000 per month for its gigabit service in some communities, making it totally inaccessible to all but the largest corporations.[61]

Incumbents also can't offer local control. When Lafayette decided to replace its internal communications system with fiber optics, BellSouth pushed hard for LUS to lease connections rather than building its own, even though BellSouth could not point to a single other utility that was leasing connections for the most critical part of its network. Public power utilities need to control their networks, not be dependent on some other entities' decisions about what is sufficiently reliable and how to prioritize repairs after outages or storms. Even if BellSouth could have been trusted to maintain a sufficiently reliable network, LUS would still have been paying more to lease rather than own. EPB, BVU, and LUS have all shown that owning the network delivers more value to the community than leasing services.

In each community, it was not their first choice to offer retail services. Bristol, Chattanooga, and Lafayette each originally sought private partners to avoid building a full citywide network in competition with incumbent providers. Bristol sought Sprint's partnership but was rebuffed. The Board of Chattanooga's EPB began with a preference for finding a partner to light the fiber optics they were laying—but after meeting with several private companies, EPB realized it needed to acquire the expertise in house and offer services itself. Lafayette built a fiber optic ring and initially decided against offering retail services in the hopes that private providers would build their own fiber connections off the LUS backbone, bringing the next-generation network deeper into communities. The private sector providers could not, or would not, justify the expense of building the last-mile connections. Before finally building its own last-mile network, Lafayette's leaders met with Cox and BellSouth. Both said that they didn't think Lafayette "needed" an FTTH network.

Financing

Public power agencies have proven the most common vehicle for community broadband investments for a variety of reasons, but a common one is financing. Investors trust public power companies to repay their debt and are well acquainted with revenue bonds issued by public utilities. Bristol, Lafayette, and Chattanooga all issued revenue bonds secured by utility assets for substantial portions of their fiber network investments.

As has been the case with many community networks across the nation, the full faith and credit of each city in this case study was not pledged. If the investment totally failed (and the utility's assets somehow disappeared), the local government would be under no obligation to raise taxes to repay the bonds.

Comparing public financing to private is a difficult, apples to oranges comparison. Private sector providers claim that the public has advantages because it can issue tax exempt bonds under certain circumstances. Often, however, the basis points saved are outweighed by the substantial restrictions, such as "private use" rules that come with public financing. Any such advantage must also be balanced by private financing advantages, including access to tax breaks and the ability of very large corporations to self-finance at low rates. In the section below on opposition to publicly owned networks, we discuss the relative advantages and disadvantages of each side, but for now it bears mentioning that a slight difference in the interest rate is small potatoes compared to other imbalances on the "playing field."

National cable and telephone companies have a tremendous advantage over single-market community broadband networks – they can, and often do, subsidize their operations in markets in which they face competition from community broadband networks by charging more in the less competitive surrounding communities. For instance, after Monticello, Minnesota built a community fiber network, Charter began offering all of its television channels and highest Internet tier to residents for $60 per month, a price that appeared to be a money loser for the company. In nearby communities, Charter charged $144 per month for the same package.[62]

> As a businessman, Joey Durel understood that an FTTH investment in Lafayette did not make sense for BellSouth or Cox. But as City-Parish President, he also understood that universal access to fast, affordable, and reliable broadband was essential for the community's future.

Ironically, the big national providers accuse local governments of cross-subsidizing (i.e., raising electric rates to artificially lower broadband rates) or raising taxes to cover losses.

In fact, many states make any cross-subsidization illegal for publicly owned networks. Tennessee and Louisiana ban all cross-subsidization for publicly owned networks, and Virginia bans it for telephone and cable services. Private companies regularly cross-subsidize from high- to low-margin divisions and from non-competitive territories, where prices are higher, to competitive communities, where prices are lower. At one time, Verizon and AT&T were the only national phone companies investing in next-generation wired networks (Verizon's FTTH called FiOS and AT&T's super-DSL called U-verse), though expansion plans for both are now frozen. Not coincidentally, AT&T and Verizon have incredibly profitable wireless divisions. If a publicly owned entity were to cross-subsidize, it does not necessarily follow that the practice would be "unfair."

As for raising taxes to cover losses, elected officials recognize the danger in doing so. Whereas cable and telephone companies can raise rates without repercussion, citizens can (and do) remove elected officials who raise taxes for unacceptable reasons.

Economic Development

Communities analyze infrastructure investments using a different calculus than private companies, which focus on maximizing profits over the short term. The community tries to maximize the return to the community as a whole.

Broadband is not an ordinary product. It is essential infrastructure – the platform on which most commerce now depends. It has high start-up costs that take years to recover. When telecommunications prices are too expensive or speeds too slow and unreliable, all businesses and residents suffer. Much like towns bypassed by canals, rails, or highways, future prospects are bleak for communities without adequate access to the Internet. DSL is insufficient to encourage economic development and the slow upstream capacity of cable networks limits its utility, particularly for those who want to work effectively from home.

Though cable television is not a necessity by itself, network economics have made offering television channels a necessity in the business plan of many publicly owned next-generation citywide networks. The emergence of Netflix streaming, Hulu, and other "over the top" video approaches may rapidly diminish the importance of offering television channels. Time will tell.

In keeping with the historic American value of self-reliance, communities should have the right to build their

own network if they so choose. The alternative leaves thousands of towns solely dependent on a few companies that do not have to fear new competition.

Some infrastructure is paid entirely from subscriber revenue, such as water and sewer systems that have had decades to amortize start-up costs. Other infrastructure is heavily subsidized. For example, user fees such as gas taxes only cover about half the cost of roads in many localities.

Arguments about what is "fair" in provisioning broadband can result in a de facto monopoly for a slow, unreliable DSL provider because it would be "unfair" to allow the local government to build a next-generation network that may not pay for itself entirely from the revenues of subscribers.

Recall that taxes raise revenue for projects furthering the public good. Imagine a community broadband network operating at a loss of $500,000 in one year. Because of its existence, the private DSL and cable companies lower their prices such that the collective benefit is $2 million per year (even as the DSL/cable companies continue to be profitable). Though the network technically lost money that year, it may be a very wise investment from an aggregate perspective. Community networks produce a variety of indirect benefits that are often not included in the spreadsheets charting their value, from spurring economic development to decreasing telecom budgets of city departments (often while increasing capacity).

Nonetheless, it is typically expected that both capital and operating costs of publicly owned broadband networks should be financed solely with subscriber revenue.

It is not uncommon for local and state governments to invest in economic development. Often this means tax breaks for new businesses or paying for the infrastructure for a new industrial park. In Bristol, the Electric division invested directly in the broadband services division of OptiNet to encourage economic development in the region. The region has benefited with more than 1,000 jobs. Many of the businesses in the region around Bristol have access to the Internet because of OptiNet. Local employers like Alpha Natural Resources remain in Bristol because of OptiNet's advanced services. Northrup Grumman and CGI could not have created hundreds of new high-paying jobs in southwestern Virginia without OptiNet connections.

OptiNet services have brought substantial private investment to the region. Large cable and DSL companies argue that public competition reduces their incentive to invest, a dubious claim given that economic theory posits competition should encourage investment (e.g., why would Charter invest substantially if it were the only cable provider in Bristol?). Regardless, Bristol, Chattanooga, and Lafayette recognized that the best they could expect from the private sector was not sufficient for their needs.

Incumbent Opposition and Lawsuits

Each of these three cities experienced withering attacks from cable and telephone companies intent on preserving the duopolistic status quo. They filed lawsuits, pushed legislation, and authored expensive advertising campaigns. Joey Durel convincingly argues that BellSouth's greatest skill was buying steak dinners and football tickets: lobbying at its best. As a result of cable and telco lobbying, Tennessee, Virginia, and Louisiana each have laws on the books that discourage public sector investment in broadband despite publicly owned networks offering some of the very best connections in their states.

As far back as the 1990s, incumbent cable and phone companies convinced the Virginia Legislature that the state would have more investment from the private sector if the public sector were not permitted to build telecom networks. One of the passages in a brief for Bristol prepared by Jim Baller, an attorney specializing in municipal broadband, in late 2000 bears repeating:

> In its motion to dismiss, the Commonwealth ironically characterized the intent of the General Assembly in prohibiting municipal participation in telecommunications as an effort to "advance the goal" of "building a modern telecommunications network in rural Virginia." Despite this high-sounding rhetoric, there is virtually no competition in local rural markets in Virginia today, and § 15.2-1500B has significantly curtailed the prospects for facilities-based telecommunications competition in central and southwestern Virginia.[63]

Virginia legislators were wrong in their belief that holding back the public sector would create space for the private sector to thrive. Much of rural Virginia continues to lack adequate access to the Internet. Over that same period, BVU Authority expanded its network as permitted by law, to meet the needs of communities where the private sector remains unable or unwilling to invest sufficiently.

Major incumbent telephone and cable companies led a massive push in 2005 to convince state legislatures to ban or cripple efforts at community networks. Louisiana was one of the targeted states with the "Local Government Fair Competition Act." Powerful lobbyists claimed that this bill would produce a "level playing field" between public and private providers, but it was designed to prevent any community from being able to build a network. Lafayette's ability to build its network was only assured after a long series of negotiations in which many of the barriers against public networks were removed or lessened. Nonetheless, the "Fair Competition" legislation resulted in more scrutiny for small, community networks while the massive out-of-state providers retained all of their advantages.

> Community networks produce a variety of indirect benefits that are often not included in the spreadsheets charting their value, from spurring economic development to decreasing telecom budgets of city departments (often while increasing capacity).

A coalition of public interest groups led the counter-effort to preserve local authority. The result was no new barriers from 2006 to 2010. Nonetheless, each year, Time Warner Cable and CenturyLink (sometimes with the help of AT&T) introduced legislation in the North Carolina legislature that would essentially prohibit new municipally owned networks. Their moment came in 2011 with the rise of anti-government sentiment in legislatures around the nation. Even though local governments were the only entities in North Carolina actually building citywide next-generation networks, the Legislature effectively outlawed additional communities from building networks.[64] AT&T's 2011 anti-competition bills in South Carolina and Wisconsin were mostly unsuccessful but Arkansas strengthened its barriers against public ownership of broadband networks.

Once again, the cable and phone companies have banded together to defeat one of the only threats of competition they face: community fiber networks. And once again, a coalition is forming to defend local authority. The argument is not that all communities should build networks as Chattanooga, Bristol, and Lafayette have done, but that all communities should have the authority to decide locally if a network is necessary and if so, what kind.

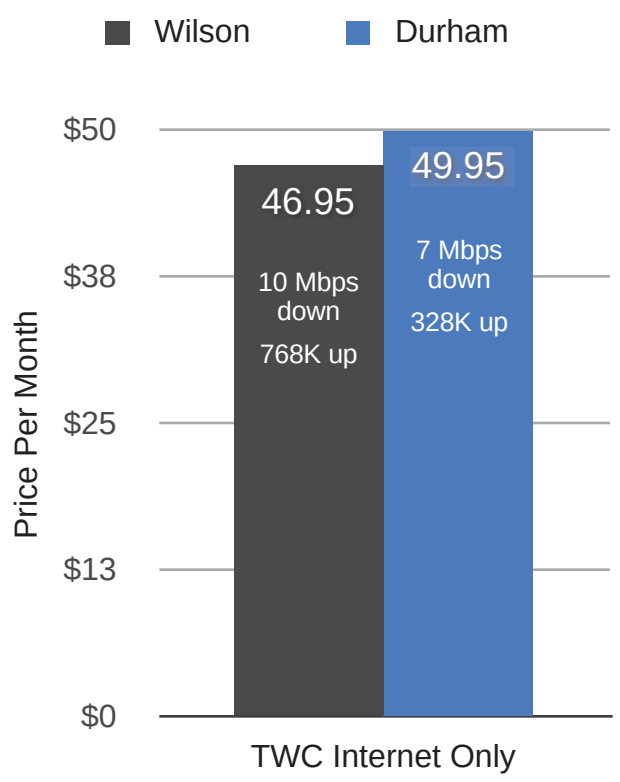
The decision about whether to build a network is a difficult one given the many challenges. Each of the communities profiled above was beset with multiple lawsuits from incumbents in an effort to derail and delay their projects. Bristol, Lafayette, and Chattanooga's experiences are fortunately not the norm. Most community networks were built without litigation, though the chances of being sued increase when a community is the first to build a network in its state. Once in court, nearly all have prevailed, though each lost significant time due to the challenge that compressed their business plan and ultimately made the project more difficult.

Once communities begin building their networks, they often see incumbent providers respond with lower prices. Sometimes these are acknowledged in the form of reduced official prices, but more often the list prices remain the same as incumbents flood the market with promotional deals and offer very low prices to high-margin business customers that must sign multi-year contracts. Figure 5 shows Time Warner Cable's response to the community fiber network in Wilson, North Carolina. Some incumbent providers, including Cox, have gone door-to-door, offering to beat whatever prices the community network offered.[65] These multi-billion-dollar companies can afford small armies of salespeople to crush their competition.

Private Sector Advantages

Chattanooga offers a specific example of the financial pressure on community networks. In order to upgrade its services to respond to EPB's fiber network, Comcast spent $15 million.[66] EPB spent more than 10 times that amount building its network – a

Figure 5: Wilson v. Durham County Time Warner Cable Internet



representative ratio. This 10:1 imbalance demonstrates one massive advantage of the entrenched incumbent: its network investment has been largely amortized. Each month, the community network has to make debt payments that the incumbent does not,.

Additionally, Comcast's buying power, as the nation's largest network and owner of many of the cable channels, means any community fiber network will pay more for content. Lafayette's exclusion from NCTC undoubtedly hurt its finances during its most vulnerable start-up phase.

Consider the disparity of lobbying clout. Lafayette hired one lobbyist in Baton Rouge while Cox and BellSouth hired, as Terry Huval hyperbolically put it, "the rest." Chattanooga can justify a single lobbyist in Nashville but AT&T had already registered 26 lobbyists three months before the 2012 legislative session started. This imbalance explains why AT&T and Cox can build their networks anywhere in Virginia and Tennessee but EPB and BVU Authority have strict territorial limits where they can build. In an industry with remarkable economies of scale, these expansion limits on publicly owned networks are a tremendous disadvantage when competing with private companies.

As if the above advantages were not sufficient for the big cable and phone companies, they also have the luxury of opacity. No one can demand Cox or Charter reveal their budgets or marketing strategies. Comcast and AT&T meetings are not open to the public. But publicly owned networks are subject to freedom of information requests – as they should be. Each state has some provisions that allow the utility to shield some data from requests, which is why no one outside of LUS knows how many subscribers they have presently. But their budgets are public, as are deliberations about the budgets. And incumbents have been known to fund the campaigns of those likely to vote for disbanding publicly owned networks (though both Bristol and Chattanooga are sufficiently popular to make such a result remote). In Lafayette, however, LUS's telecom competitors have lobbied against non-telecom-related rate increases simply to harass the utility.[67] And though Lafayette does not have to divulge secrets, it must process each public records request made by Cox – allowing Cox to use the freedom of information request as a weapon against its competitor, forcing LUS to waste its resources responding to frequent requests.

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BVU Authority, EPB, and LUS are subject to all the regulations of the private sector but have to answer to additional authorities, from special state regulations to getting approval from TVA (in the case of BVU Authority and EPB) for loans and allocation models.

In the face of these challenges, the surprise is not why some community broadband networks struggle, it is how remarkably impressive the accomplishments of LUS, EPB, and BVU Authority are.

Lessons Learned / Advice

The public power utilities in Bristol, Chattanooga, and Lafayette offer many lessons to other communities considering broadband networks. They have welcomed questions from communities near and far and opened their doors to show off their networks.

When undertaking such a challenging investment, mistakes are unavoidable. Some will be quite painful. The most successful communities have taken more time in planning and picking their partners (vendors, consultants, etc.) to ensure they will be able to overcome challenging obstacles.

Preparation

Good luck seems to come to those who prepare for it. A good question for most cities considering the idea of building a network is how to prepare. They must examine whether the community can be motivated to take on what might be a substantial amount of work and a huge expense. This is quickly followed by questions about who has been successful, who has failed, and the lessons learned in either case. This early preparation must be done. The work is often confusing and hard, which is why successful community networks often start with a tireless champion who takes responsibility for moving the process along.

> The argument is not that all communities should build networks as Chattanooga, Bristol, and Lafayette have done, but that all communities should have the authority to decide locally if a network is necessary and if so, what kind.

The next part of the process involves developing a vision of what is necessary for businesses to flourish, educational opportunities to abound, quality of life to continually improve, etc. Unfortunately, many in the community will simply not understand what they will need as technology continues to change. When electricity was introduced, most people thought they had no need to replace their iceboxes and kerosene lamps. Similarly, many are presently satisfied with the capacity provided by cable networks, partially because they have not experienced significantly faster speeds, particularly the upstream speeds that allow them to be producers as well as consumers of content.

In trying to understand the need, it is less important to see today's requirement than to look three to five years down the road – especially considering it will take several years to get from this step to offering services. Indeed, good network architects try to get a feel for trends going 10 years out. To build a sustainable network requires this longer view.

It is easy to get diverted considering things like how fast is fast, and what applications will be needed. A useful parallel is that of electricity. We don't think about the maximum amount we can draw into our homes, we just expect to plug in something new and have it work. Our broadband networks should do no less. Junior should not have to stop playing video games so Mommy can video chat with her sister and Dad can finish watching the game. Developing a sense of what is needed requires more work than merely asking people and businesses what they want. Often it entails extrapolating from what people say they need now, and speaking with people in the technology businesses who are not vested in maintaining the status quo. As Steve Jobs said, "A lot of times, people don't know what they want until you show it to them."

When faced with the community's thoughts on what is needed, incumbent providers will almost certainly say their DSL/cable solutions are adequate and they are happy to serve anyone who wants to pay more for a faster connection. Of course, the price of those faster connections may be 10 times that charged by a community network. If there is a local chamber of commerce, incumbent providers will try to turn it against any new project.[68] Communities often have a choice at this point: sacrifice part of the vision or embark down the challenging path of building a network to realize the vision.

Communities need a champion and a galvanizing group of citizens, local businesses, local schools, and technology savvy folk that will inform themselves and then educate the public. This bears emphasizing – someone has to take responsibility and be the "go to" person. Before any community borrows millions of dollars for a network, those making the decision should be well informed and prepared for the likely incumbent backlash. Decision makers should reach out to, meet

with, and if possible, visit other networks. The right consultant can be invaluable if you choose to use one, so decide what you are seeking and choose wisely. Above all, when you know what you want, try to fully identify what you need, and then commit to moving the process forward.

Developing the Plan

Try to avoid the trap of study after study. It may not be helpful to pay tens of thousands of dollars for a study, or to demand months of work from an appointed citizen commission, to learn that 80 percent of residents would generally like to pay less for triple play services from a local, publicly owned network at some indeterminate point in the future (ignoring that the whole market will have changed by then). Feasibility studies can be useful but can also distract from the necessary work of understanding the full community need, building partnerships, and considering broader solutions.

> A useful parallel is that of electricity. We don't think about the maximum amount we can draw into our homes, we just expect to plug in something new and have it work. Our broadband networks should do no less. Junior should not have to stop playing video games so Mommy can video chat with her sister and Dad can finish watching the game.

As the plan goes forward, decision makers should listen carefully to others. For those communities that do want assistance from existing networks, it tends to be available. BVU Authority operates a division focused on helping other communities, and EPB Fiber Optics staff has met with many communities that went on to build their own networks. Colman Keane, Director of EPB Fiber Technology, candidly admitted that he could tell who came to listen and who did not. They have watched as some networks made poor vendor decisions or made poor technical decisions because they were unwilling to ask for advice or listen to it when offered. Given the fierce opposition of the big cable and phone companies, any struggling community network hurts all community networks.

BVU developed independent business plans and commissioned market surveys to verify the assumptions and figures in one against the other. It wanted to ensure it had a plan that was realistic and gave it the best chance for success. Chattanooga devoted serious resources to its planning efforts many years before it finally developed a project with which it was comfortable, after it had spent years serving local businesses with telephone and Internet services. Lafayette waited for several years after developing its ring for a favorable alignment between local politics and affordable FTTH electronics. Though each developed legally sound plans, they have found themselves in courts and at their respective legislatures to defend their networks.

Timing can be crucial when evaluating whether a community network is a good fit. If they had to start over, Durel is not sure Lafayette could mount a successful campaign for the network due to the present City-Parish council. The Council that supported the network was experienced and understood what was at stake. Consider Longmont, Colorado, which held a referendum in 2009 to gain authority for a community network. It failed following a massive "vote no" campaign, bankrolled by the state cable association. In 2011, Longmont tried again and, despite an even more expensive campaign by the pro-cable group, the city overwhelmingly approved it. After the first failed referendum, more citizens learned about the project and became inspired to organize a grassroots campaign to educate others.

Several EPB employees mentioned their "no surprises" policy in dealing with elected officials while EPB was developing the fiber plan and defending it against Comcast and AT&T attacks. They wanted to keep their board, elected officials, and local leaders in the loop regarding the project and challenges. When EPB was being unfairly denied entry to NCTC, EPB counsel regularly communicated with the board. He wanted them to be aware of the situation and ensure that before he threatened to sue, they knew the strategy and would not back down if EPB actually had to go to court. At no point did EPB want to get ahead of the board or elected leaders.

Communities should embrace controversy and public meetings. The more incumbents or incumbent-funded anti-government groups want to oppose a network, the

more opportunities for those supporting the local network to educate the public and keep the project in the limelight. Any community caught in a nasty fight should examine how Lafayette dealt with it and ask John St. Julien for advice. Seriously, ask him for advice.

BVU Authority Chief Technology Officer Mark Lane specifically encourages communities to develop a reasonable business case – one that does not require taking half the market immediately (his experience notwithstanding). It is better to develop a plan that can grow organically. Chattanooga waited years until they found a plan with which they were comfortable. Lane further advises not to be afraid to compete against a big competitor, but understand that you will spend more per subscriber than it does. That should actually be an advantage by allowing you to put a friendlier, human face on your services. Don't worry about going door to door beating the bushes for subscribers until the initial rush is dying down – there is little need to waste marketing dollars just to put people on a three-week waiting list.

Harold DePriest believes the most difficult challenge is "developing the business systems and processes needed to sell, hook up, and bill thousands of new customers." His advice:

> Don't skimp on programming, middleware, or customer service and don't try to sell on price. We have done a few smart things in marketing our services particularly in terms of strategic decisions, like selling on value rather than price, but most of our efforts have been in building the system, getting business systems and processes up and working, hooking up new customers in mass, and integrating all of this into our daily operations. That has kept us busy enough for the past 2 years.[69]

Building the Network

Utilities and local governments need a board, mayor, and/or city council prepared to weather a three-year storm once they have committed to building the network. The situation may look bleak in the second year and many critics will take shots at the decisions and outcomes, even if the project is destined to succeed. Common sentiments from BVU, EPB, and LUS are "Put your seatbelt on" and "If you aren't ready, don't get into it." Be sure to ask the following questions:

1. How can I be customer-centric?
2. What will make my customer happier?
3. What is the customer really looking for?

Regarding the final question, Henry Ford is said to have said, "If I asked my customers what they wanted, they would have said faster horses."

> Communities should embrace controversy and public meetings. The more incumbents or incumbent-funded anti-government groups want to oppose a network, the more opportunities for those supporting the local network to educate the public and keep the project in the limelight.

Consultants are an important part of each phase in building networks but on the day a network goes live, the utility or city department has to answer for it, not the consultant. Communities should be aware that they can make mistakes and not overestimate their own abilities. When choosing consultants, be sure to talk to their past clients and do independent research before making any final decision.

When evaluating vendors, EPB's Colman Keane recommends talking to as many of them as you can. Communities should also follow up on references from other communities that have worked with them. It helps to recognize that regardless of what vendor a community chooses, the gear will have bugs and the systems will have problems. A key question is how well a vendor responds to these issues and how easy they are to work with in quickly finding solutions.

Those responsible for the network should be intimately knowledgeable about it. Chief Technology Officer Mark Lane could probably sketch the OptiNet network on a napkin while blindfolded. Before EPB was ready to launch its services, Network Architect Larry Hinds knew every inch of it, including the areas most likely to cause problems.

Of course, EPB is one of the largest public power utilities in the country and can afford to have a person like Larry Hinds on staff. The smaller the proposed

network, the more a community may have to rely on outside consultants, but there is a danger in relying too much on consultants who have different incentives than the network owners. BVU Authority, which is considerably smaller than LUS and EPB, has tried to directly employ the brains behind the network while contracting out much of the labor in building it. Nonetheless, they have turned to trusted consultants for advice as needed.

When considering whom to hire, utilities and local governments are smart to find people with experience in the relevant fields. Employees of public power and local governments are accustomed to working on important infrastructure projects, but may not have enough experience in the cut-throat telecom industry. Getting out of the monopoly mentality is essential, particularly when considering marketers. BVU has regular meetings to assess their progress and revaluate strategies. As EPB was rolling out its services to residents, it surveyed new subscribers on the process and quickly tweaked its approach to ensure well over 90 percent were regularly satisfied.

Henry Ford is said to have said, "If I asked my customers what they wanted, they would have said faster horses."

Some design decisions can result in higher or lower operating costs down the line, often inversely proportional to the upfront costs. Consultants may be predisposed to minimizing upfront costs because they either will not be around to deal with the higher operating costs or they will be the beneficiary of those higher costs down the road.

For instance, Chattanooga has a lower cost of connecting customers than Lafayette because EPB spent more upfront in planning for each potential subscriber. Long before EPB began offering services, it had personnel walk the routes that would eventually carry the fiber cables, creating a GIS map and describing the challenges of connecting any given property (rocky soil, will the cable have to cross a road or driveway, etc.). When a Chattanooga resident signs up for services, the back office system already knows if there are special circumstances needed to connect. By contrast, when a resident requests a connection to most municipal networks, a contractor drives out to survey the house to assess trouble spots and find the closest available fiber to connect to the house. If the next-door neighbor signs up a month later, another contractor repeats the process – a wasteful duplication of labor.

Not only is EPB's approach more efficient, it results in a better relationship with the subscriber because the customer will know at signup how long it will take to connect services. This approach increases the upfront costs, which leads some consultants to skip this step in order to lower their bid for cash-stressed local governments. Some consultants or contractors may even prefer the less efficient method if the contract results in them making more money on the extra truck rolls. The network's design should already be in GIS, and adding a new layer with this information at the start is a very good idea.

After getting estimates from vendors, EPB staff went through the proposals line by line to minimize costs. Working with their preferred vendor, they found ways to shave millions off the bid with a variety of changes, including using a local contractor for materials supply rather than the vendor. They arranged the architecture of the network to keep some expensive routers in the head end rather than in distribution huts, to ensure they were used at full capacity. The original plan would have required more routers (good for the vendor) but they would be running at lower capacity than necessary given the significant investment in each.

EPB's size may have given it the freedom to devote more resources toward finding cost savings and more efficient approaches than the average utility or local government. While Harold DePriest strongly encourages community network providers to write their own business plan so they will fully understand it, communities are likely to rely on consultants to varying degrees. To be successful, those running the network *must* fully understand the business plan. DePriest offers the following related advice:

> Write out and detail your key assumptions. That is where all the risk is. The rest of the plan is just spreadsheets and math. Those of us in the business can give you good estimates of staffing levels, product and capital costs, and margins as well as advise on vendors and contractors.[70]

Running the Business

The first three years of running the network will likely be a blur. The network has tremendous pressure to meet subscriber and revenue targets but may not have enough cash flow to justify enough employees to deal with the challenges of rapid growth. Subscribers have more questions and need more assistance within the first few months of connecting than at any other time (another advantage for established incumbents). When the power goes out, some people will call the power company to alert them. When the cable goes out, even for a few seconds, during a football game, far more people will call in. Each of the utilities has said that the triple-play services generate far more calls than they expected, whether for outages or simply because of the subscribers who wants to change his channel packages three times in one week.

This is also the period when the market may finally become "competitive," a somewhat ambiguous term. Some claim the DSL versus cable market is already competitive because the phone and cable companies advertise against each other's products. As community networks quickly discover, adding a third option brings the competition to a whole new level. Regardless of whether they change their list prices, the incumbents will likely start offering much better promotional rates (often that do not expire) and even investing in better services. Communities have to have a marketing plan that anticipates these challenges.

Given BVU's standing in the community, it might have been tempted to lower its marketing budget. A number of municipal fiber networks brag that they keep overhead lower by not marketing, something BVU Authority's Vice President of Marketing and Business Development, Kyle Hollifield, warns against. "If you want to see the value of marketing, stop doing it for a year. You could lose five years in the business plan." Given OptiNet's success, others are wise to take those words to heart. Generally, the networks that do not market themselves well do not achieve significant subscriber penetration and can fall behind on their business plan.

According to the 2007 Business Plan, EPB's advertising budget would be set at 2.25 percent of gross sales, spending about $0.75 in sales collateral per location passed.

Table 7: EPB Proposed Advertising Budget

Startup Expense	$250,000
Year 1	$229,951
Year 2	$218,818
Year 3	$667,108

It can be a marketing benefit to be part of the utility because subscribers and ratepayers want simplicity. Hollifield emphasized that the key is one bill, one point of contact. BVU Authority strives to make everything as simple as possible for customers, in ways that utilities offering only monopoly services may not have considered. For public power utilities entering the telecom space, this can be the difference between financial success and struggling: are you really committed to putting the customer first? Chattanooga's proactive crediting of subscribers when the electricity is out or when other technical problems take out their services shows that they have moved beyond a monopoly mindset into a competitive mindset.

Historically, electric utility workers did not have to enter the house. Moving from outside the house to inside the house is a challenge for any utility. Suddenly the technicians have to be trained on proper etiquette (never, ever use the customer's bathroom) and have to be prepared for edge cases, including homeowners answering the door inappropriately.[71] This is a serious challenge, particularly when hiring and training contractors, a common practice to deal with boom/bust cycle of customer connects. EPB has a staff of installers but also contracts additional work out – though only to people who have gone through the EPB training program to ensure they will live up to its image.

When an installer makes a mistake, it helps to have a good reputation or reservoir of good will. When an installer from a big cable company acts rude, it fits the sad narrative surrounding their singular focus on profits. When an EPB Fiber Optics installer makes a mistake, that customer is less likely to blame the whole utility because of the good experiences they have had in the past with EPB. It takes time, and a lot of effort, to build that credibility.

Though this is an intimidating business, Harold DePriest tries to keep everything in perspective, noting that the cable and DSL companies tend to be bureaucratic and siloed, and generally to lack a sense of urgency, which may change as communities introduce real competition. In general, they have poor systems for tracking and fixing customer service problems, which creates opportunities for community providers to fill that gap.

As detailed in the discussion about OptiNet, BVU Authority is very focused on providing customized services to local businesses, particularly phone-related solutions. EPB is only starting to focus on that market in the whole territory (having previously gained experience providing telephone services to some 2,000 businesses). LUS, however, does not want to provide services beyond the triple-play. The utility remains skittish about being accused of competing with the private sector. Whereas few in the community mind that LUS is competing against Cox or AT&T, LUS does not want to step on the toes of competitive local exchange providers that provide specialized services to local businesses (many of those companies have historically used LUS's wholesale network to offer their services). This decision has undoubtedly resulted in LUS forgoing revenue that would otherwise help its financials, but that is its choice.

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Communities that decide to embrace specialized services for businesses, as OptiNet has, will want to make sure they have a rock-solid platform before beginning to offer those services or, at the least, use very enthusiastic local businesses as guinea pigs when the network is starting. Serving businesses requires a good reputation and few things are more damaging than subscribers complaining the service was unreliable.

Build it and They Will Come

All three of these networks have recognized that though they have built it, people and businesses are not naturally going to push the limits and take full advantage of the network. BVU Authority has built a demo room to show off its technology; EPB and the Lyndhurst Foundation have promoted numerous events and opportunities for entrepreneurs; and LUS has sponsored events and conferences. Lafayette also has Fiber Corps, a non-profit model organization created by Geoff Daily, who moved to Lafayette specifically to create this organization that would develop pilot projects for one of the most advanced communications networks in the world.

As big of a challenge as it was to build the network, many in Lafayette realized that completing the vision – using the network – would also be a significant challenge. But this challenge would not be shouldered by LUS or the Consolidated Government alone. It was a challenge for the community.

Comprised of six major stakeholder organizations, Fiber Corps includes the local government, the Economic Development Authority, Chamber of Commerce, University of Lafayette-Louisiana, Community Foundation of Acadiana, and Louisiana Immersive Technologies Enterprise (LITE). They meet on a quarterly basis to discuss better methods to work together. Daily recognizes that social barriers, not technological, are the limiting factor for the community taking full advantage of the network. Community networks are not merely more advanced broadband networks but represent a larger vision for how this infrastructure interacts with the community.

Daily chose a nonprofit model to ensure its motivations would not be suspect – it is an honest broker looking to enable economic development from the community network. Its initial project focused on health care – the Louisiana Health Information Exchange has selected Lafayette as the region for its pilot project, in large part due to Fiber Corp's coalition building.

Fiber Corps is also working with high school students to provide a 3D render farm, allowing them to learn digital video skills – skills that are increasingly in demand in Lafayette due to companies like Pixel Magic that have located in Lafayette because they have access to the ultra-high-capacity networks that are essential for their business model.

Another goal is replicability. Fiber Corps wants to share its approach widely but recognizes that each community is unique and the work is difficult. Just as we now have a better sense of how to build a proper community fiber network, soon we will have better tools and establish practices for maximizing its benefits.

Conclusion

Bristol, Chattanooga, and Lafayette have each built impressive networks that have significantly improved prospects for economic development while creating myriad benefits to residents and businesses within each community. Each has had to overcome significant incumbent opposition to build a network where they were consistently the underdog.

Each committed to networks at a time when it was still possible to imagine the private sector solving the need for faster, more reliable, and more affordable access to the Internet. Unfortunately, the past year has brought announcements that Verizon would no longer expand FiOS and AT&T would cease expanding its U-Verse deployment. For years, some have warned that America is heading toward a Looming Cable Monopoly due to cable's comparative advantage in providing high speed access to the Internet relative to DSL and the difficulty of overbuilding entrenched cable incumbents.[72] These fears were confirmed by 75 percent of broadband additions in 2011 choosing cable.[73]

For the foreseeable future, communities limited solely to DSL and cable should not expect any other company to solve their broadband problems. States and the federal government are more likely to cut budgets than create new programs to expand broadband access. In short, help is not on the way. Communities that want better access to the Internet should seriously consider how they can invest in themselves.

Louisiana, Tennessee, and Virginia are among the nineteen states that have created barriers to discourage publicly owned networks despite the reality that these networks are delivering some of the best connections available in the nation. Such barriers are inconsistent with the goals of the 1996 Telecommunications Act and the recommendations of the Federal Communications Commission's National Broadband Plan. However, the cable and DSL lobbyists are powerful in state legislatures and the media rarely covers these technical, wonky matters. Absent federal action, communities may see more barriers in the near future to building these essential networks rather than fewer.

It is regrettable that decisions over community broadband are framed as public v. private. America has thrived because of both the public and the private. From the canals to the interstate highways, the public has played a key role in building the infrastructure used by all businesses. Presently, many businesses are less competitive and productive because they do not have sufficient access to modern networks at reasonable rates. Limiting the public's ability to invest in essential infrastructure today is a serious mistake.

The question is not whether any or every community should build a network, the question is who should make that decision. A decision of this import should be made locally, not by distant politicians in Washington, DC or state capitals.

The achievements in Bristol, Lafayette, and Chattanooga are impressive and should send a message to other communities that the community network approach is worth evaluating. If your community decides to take it to the next step, get as informed as possible and get in contact with those who have already done it.

Appendix

Some networks serve multiple communities. Our Community Broadband Map charts the number of communities with a community broadband network and is available at http://MuniNetworks.org/communitymap

Cable Networks

Kotlik, AK
White Mountain, AK
Ketchikan, AK
Opp, AL
Scottsboro, AL
Sylacauga, AL
Conway, AR
Paragould, AR
San Bruno, CA
Groton, CT
Valparaiso, FL
Doerun, GA
Thomasville, GA
Elberton, GA
Forsyth, GA
Monroe, GA
Algona, IA
Alta, IA
Coon Rapids, IA
Grundy Center, IA
Harlan, IA
Hawarden, IA
Independence, IA
Laurens, IA
Muscatine, IA
Manilla, IA
Manning, IA
Mapleton, IA
Orange City, IA
Osage, IA
Reinbeck, IA
Spencer, IA
Sanborn, IA
Lebanon, IN
Barbourville, KY
Bardstown, KY
Williamstown, KY
Monticello, KY
Hopkinsville, KY
Frankfort, KY
Glasgow , KY
Murray, KY
Braintree, MA
Norwood, MA
Russell, MA
Shrewsbury, MA
Easton, MD
Coldwater, MI
Crystal Falls, MI
Negaunee, MI
Norway, MI
Wyandotte, MI
Rushmore, MN
Westbrook, MN
Kahoka, MO
Poplar Bluff, MO
Newburg, MO
Collins, MS
MI-Connection, NC
Morganton, NC
Bryan, OH
Wadsworth, OH
Woodsfield, OH
Ashland, OR
New Wilmington, PA
Pitcairn, PA
Beresford, SD
Columbia, TN
Fayetteville, TN
Greenville, TX
Spanish Fork, UT
Tacoma, WA
Oconto, WI

Fiber Networks

Opelika, AL
Loma Linda, CA
Glenwood Springs, CO
Dunnellon, FL
Gainesville, FL
Quincy, FL
Dalton, GA
Bellevue, IA
Cedar Falls, IA
Lenox, IA
Highland, IL
Crawfordsville, IN
Auburn, IN
Lafayette, LA
Holland, MI
Barnesville, MN
Crosslake, MN
Monticello, MN
Windom, MN
North Kansas City, MO
Marshall, MO
Salisbury, NC
Wilson, NC
Churchill, NV
Sallisaw, OK
Monmouth, OR
Kutztown, PA
Brookings, SD
Bristol, TN
Clarksville, TN
Chattanooga, TN
Morristown, TN
Jackson, TN
Pulaski, TN
Tullahoma, TN
UTOPIA, UT
Bristol, VA
Burlington, VT
Benton PUD, WA
Chelan PUD, WA
Franklin PUD, WA
Grant PUD, WA
Kitsap PUD, WA
Okanogan PUD, WA
Pend Oreille PUD, WA
Baldwin, WI
Reedsburg, WI
Shawano, WI
Philippi, WV
Powell, WY

References

1 BVU's official name is now BVU Authority. However, we refer to it as just BVU when discussing actions it undertook prior to the name change.

2 Though the network would be capable of transmitting at 1Gbps, most residents and businesses would be connected at more modest speeds using BPON technology.

3 Virginia Code §§ 15.2-1500B

4 1996 Telecommunications Act, Section 253(a)

5 The SCC was concerned about BVU potentially undercutting Sprint, which is why it gave BVU a price floor, as opposed to a price ceiling that would have been meant to protect consumers.

6 SB 875 was passed in March of 2003.

7 Reconstructing the old prices is hard. Another source suggested Charter was charging 44.43/month.

8 See "Opti-Mistic" by Joe Geraghty in the Bristol Herald Courier on July 25, 2004

9 Ibid.

10 Dong-Hee Shin, Won-Yong Kim, Dong-Hoon Lee, (2006) "Future public information infrastructure: lessons from four US case studies", info, Vol. 8 Iss: 3, pp. 47 – 59. http://www.emeraldinsight.com/journals.htm?articleid=1554528&show=html

11 Booking the $23.7 million as debt was a conservative hedge by BVU AUthority in the event that the SCC did not accept the rate models and required BVU Authority to allocate additional costs to telephone or cable services.

12 Phone call with Wes Rosenbalm on November 2, 2011

13 The Washington County Board of Supervisors chooses which of themselves will serve on BVU's Board.

14 The debt was across multiple divisions, not just OptiNet.

15 Fiscal Year 2008 ended on June 30, 2008.

16 Project Summary: http://www.ntia.doc.gov/legacy/broadbandgrants/applications/factsheets/4506FS.pdf

17 When BVU forgave the debt to itself, it was not distributing electricity from TVA, which prohibits such practice in its contracts.

18 CenturyLink was created by the merger of CenturyTel and Embarq after Embarq bought Sprint.

19 Eric Lampland of Lookout Point Communications

20 BVU Authority has received the contract to build the fiber optic laterals but has not completed the work.

21 Terry Huval Presentation to City-Parish Council on October 18, 2011.

22 Note any of the many popular festivals the community hosts throughout the year.

23 Lafayette was the ninth most conservative city in America in 2005 according to the nonpartisan Bay Area Center for Voting Research.

24 Cities often have the authority to bond from a number of different statutes. The lawsuit alleged that the bonding statute used by the city required a referendum, not that the "Fair Competition Act" required a referendum.

25 In the following year, incumbents successfully pressured the legislation to require a referendum for future community networks.

26 Menefee also wrote about the broadband battle at his lusftth.blogspot.com, but has since removed the site.

27 http://www.sbc.senate.gov/public/index.cfm?a=Files.Serve&File_id=646b01b6-6e75-4f5a-9c0f-790c0ba48889

28 http://www.lafayettela.gov/presidents/dpt120pressreleases.asp?id=7274

29 For several years, NCTC maintained a moratorium on new members but then allowed some private companies to join, including Cox and Charter. It was after this period that Chattanooga, Lafayette, and Wilson attempted to join but were refused entry.

30 http://theadvocate.com/news/acadiana/1827782-123/lus-fiber-to-join-cable.html

31 See Lafayette Resolution No. R-042-2005

32 See the Digital Divide Committee Report of May 17, 2005 http://www.lafayetteprofiber.com/imagesNRef/Docs/DDFinal.htm

33 In 2009, the Lafayette League of Women Voters developed a study, Everybody's Network: Building a Vibrant, Connected Community through Lafayette's Fiber Network Ownership.

34 http://www.sbc.senate.gov/public/index.cfm?a=Files.Serve&File_id=646b01b6-6e75-4f5a-9c0f-790c0ba48889

35 Ibid.

36 Using a star topology.

37 http://blog.lafayetteprofiber.com/2009/04/cox-gets-50-megs.html

38 http://www.heraldtribune.com/article/20100907/ARTICLE/100909825/-1/news?p=all&tc=pgall

39 http://www.theind.com/news/9840-lafayette-smokes-country-in-median-income-growth

40 The Tennessee Valley Authority was created during the Depression to deliver low-cost electricity to areas of the Appalachian region that had been ignored by the private sector utilities.

41 Jackson Energy Authority provided cable television services directly even as it wholesaled access to ISPs reselling the phone and Internet access services.

42 http://www.timesfreepress.com/news/2008/feb/20/epb-approves-fiber-financing/

43 http://www.timesfreepress.com/news/2009/sep/16/fiber-takes-cable/

44 A network conceived before the dot-com bubble burst, Networx struggled from its start in 2001 with its wholesale-only business model. It was later sold to Zayo Networks.

45 As reported by the Times Free Press on July 26 2008 in "Chattanooga: Reshaping the Telecom Landscape." http://www.timesfreepress.com/news/2008/jul/26/chattanooga-reshaping-telecom-landscape/

46 Ibid.

47 http://timesfreepress.com/news/2012/feb/18/c1-strong-fiber optic-signups-will-speed-epb-debt/

48 http://chattanoogan.com/2012/1/23/217860/Fed-Up-With-Comcast-s-Customer.aspx

49 Telephone call on March 29, 2012

50 http://www.lbl.gov/Science-Articles/Archive/EETD-power-interruptions.html

51 EPB has more automated smart switches across its territory than any other utility. It has invested in a similar number of smart switches as are used by ERCOT - the grid covering much of Texas.

52 EPB had last increased rates in 2007. Without the 2011 storms, the rate increase would have been slightly lower.

53 http://timesfreepress.com/news/2011/jun/17/epb-board-approves-five-percent-rate-increase/

54 http://www.muninetworks.org/content/knoxville-news-station-envious-chattanooga-fiber-network

55 http://www.muninetworks.org/content/fate-community

56 See an analysis of BBB data: http://finance.yahoo.com/news/pf_article_112464.html or see the most hated companies in the US in 2011: http://www.cbsnews.com/8301-505125_162-49140812/20-most-hated-companies-in-america/

57 Though some mobile wireless carriers are starting to compete with DSL, the restrictive bandwidth caps and high prices make that approach a poor solution for most household needs.

58 http://yalelawandpolicy.org/29/the-looming-cable-monopoly

59 http://www.muninetworks.org/content/we-told-you-so-subscribers-abandon-dsl

60 http://www.timesfreepress.com/news/2011/jun/05/wire-wars-heat/

61 Prices for these high end services tend to be negotiated individually.

62 http://www.muninetworks.org/content/charter-fights-dirty-kill-competition-monticello

63 http://www.publicpower.org/files/PDFs/BVUBFilingBrief3901.pdf

64 Though the legislation purports to only set conditions for investment, those conditions are rigged to be all but impossible to meet. The supposed rural exemption is all but impossible to meet.

65 LUS has price controls under the "Fair Competition Act" that set its minimum rates. Regulatory agencies are usually tasked with ensuring consumers are not fleeced but the state is more concerned about Lafayette's rates being too low rather than too high.

66 See endnote 43.

67 See Terry Huval Testimony to the U.S. Senate Committee on Small Business & Entrepreneurship - http://www.muninetworks.org/content/lafayette-and-level-playing-field

68 Lafayette City-Parish President and former Chair of the Chamber of Commerce Joey Durel argues that any good chamber should be focused first on jobs. If a chamber is more interested in protecting the turf of one member than creating new jobs and lowering the price of telecommunications for all its members, there is little the community will be able to do to change its position. In managing its relationship with the local Chamber of Commerce, Bristol made an interesting point – it ensured the chamber would not be in a position of having to choose between the existing providers and it as a new provider.

69 Harold DePriest Presentation to American Public Power Association in June, 2011.

70 Ibid.

71 For some reason, it seems that older men occasionally answer the door in the buff.

72 See note 58 or http://www.ilsr.org/information/publications/publicly-owned-broadband-networks-averting-looming-broadband-monopoly/

73 http://www.fiercetelecom.com/story/cable-surpasses-telcos-broadband-subscriber-race/2012-03-20

Glossary

Selected terms and their definitions.

Bits and Bytes - A bit is the fundamental unit of information. A byte is 8 bits. Information in transit (as in moving across a network) is typically measured in bits and expressed as # bits per second. Information at rest (as on a hard drive) is measured in bytes. 1,000 bits = 1 Megabit; 1,000 Megabits = 1 Gigabit; 1,000 Gigabits = nirvana.

Pass - The physical pass of the network is the fiber cables running up and down the streets of a community. Drop cables connect homes to the pass. The number of households passed refers to the number of households that can take service from the network.

Take Rate - The percentage of the market that is subscribing to a provider.

Triple Play - The triple play are the three core services of modern telecommunications: telephone, cable television, and broadband access to the Internet

Truck Roll - Sending a technician to solve a remote problem.