

Town of Cushing Broadband Planning Report

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Background & Report Overview

Axiom is providing this report as part of a regional initiative called the Midcoast Internet Coalition (MIC), whose goal is to create a locally owned broadband utility, open access network that would be more responsive to community needs. As part of this effort, in June 2021, the towns of Camden and Rockport formed a regional broadband utility called the Midcoast Internet Development Corporation (MIDC). Rockland and Thomaston applications to join the MIDC are pending. Together these towns are referred to as the original Core Four. As part of their outreach to surrounding towns outside of the original Core Four communities, MIC offered to help each of the communities interested by providing a report that will do two things. First, allow these communities to strongly consider being part of a regional open access network. Second, to also have the information necessary to consider a stand-alone option that would enable any individual community to move forward independently.

Cushing is in the position to consider multiple partners to help you reach your goals. You can work with incumbent providers- either Spectrum or Consolidated. Each of these companies can offer different solutions than their current offerings now. We assume that after agreeing and signing onto the principles of the MIC, you would consider working with Spectrum or Consolidated less than optimal. Given that it would be more likely to consider a public ownership model that would serve every home in the community, we have provided the cost of construction for a new fiber system that would serve every home. The new system could be part of the MIDC or be a municipally owned network that a single provider would operate on behalf of the Town. Understanding the viability and the steps to move forward will arm the community with what they need to make decisions.

The climate for implementing high-speed broadband has never been more favorable than today. The COVID-19 pandemic has made broadband disparities across the nation far more apparent, and both state and federal funding opportunities have increased as a result. There has never been a more opportune time to consider internet expansion. Significant local, regional, state, and federal dollars are being allocated toward solving the digital divide that

many rural communities are experiencing. Maine will receive over \$150M in near-term funds from the recently passed infrastructure bill. Unfortunately, many towns, like Cushing, have multiple internet delivery systems that do not necessarily cover the entire Town, and areas that have service greater than 100Mbps/20Mbps will be considered served. This level of service would eliminate receiving grant funds for any address served by Spectrum. And because of Spectrum coverage, it will limit the option to "fill in" those areas not covered by the cable company and may require the Town to view a complete build as necessary to achieve their goals of equal service for all.

Benefits of Fiber

There is no question that fiber optic connections can bring tangible benefits to Cushing. COVID-19 has made those previously skeptical about the need for broadband more understanding of the importance of a speedy, reliable connection for working or schooling from home. Demands on the current technology utilized by Spectrum and Consolidated Communications are finding their limitations as consumer demand increases.

Whichever broadband infrastructure model the community chooses to pursue, Axiom recommends a Fiber Optic internet system which is-

- A generational investment that will last 30 years or more
- Scalable and able to meet increasing demand
- The most reliable technology on the market today- it just works

Incumbents

The primary providers of internet service in Cushing are Spectrum and Consolidated Communications. LCI may also have fiber assets in the region. The Broadband Committee is not particularly favorable toward either provider (Spectrum or Consolidated) expanding their current service. However, given Spectrum's coverage area, the Committee should remain open to an expansion plan by Spectrum. On the other hand, while considering an expansion of Spectrum service as a low-cost, low-risk option to the Town, it would also come with questions that would need to be acknowledged. Spectrum would be using their current copper-based technology, not fiber optics, and the limitations of that copper-based system would continue to affect customer experiences. Past expansions by Spectrum in other communities have not served every home, and if that is a fundamental goal of the Committee, you should insist on a complete buildout that includes every premise in the community.

Both incumbent providers could be a serious choice for Cushing to consider, but it depends on several factors and compromises that the Town would have to make. First, it is unlikely that the Town would own the system with either provider. Second, the Town would be acknowledging the status quo. Spectrum and Consolidated each bring very different views to a partnership.

- Spectrum- would need to expand their network, which would likely save on cost as they would not need to replace their existing network.
 - Co-Axial copper system
 - Unclear if they would expand to every home if asked
- Consolidated Communications- would possibly consider building fiber across the whole Town, replacing their current DSL (Digital Subscriber Lines) service with a fiber optic system, if you requested a price from them.
- LCI might also consider expanding service, but many communities are finding them overwhelmed with business expansion projects, so it is unclear if they would view Cushing as a top investment priority

New Providers

If none of the incumbent providers provide a solution that meets the objectives of the Broadband Committee and community, working with an Internet Service Provider (ISP) not currently in Cushing is the second viable option. There may be a strong desire within the Broadband Committee to explore other possibilities beyond Spectrum, Consolidated, or LCI. However, the work of the Committee and outreach to the community over the next several months will help develop the path forward for the Committee and the Select Board to make decisions.

- New Providers more open to a municipal ownership model
- New Providers open to not owning the infrastructure but act as an operator of the system
- New Provider may meet more of the Broadband Committee's goals and objectives
- Working with MIC to become part of the new utility being formed

Ownership Models

There is an increasingly large number of ownership models in Maine for the Broadband Committee to draw inspiration. Owning your system does have benefits, most notably having the ability to contract with the ISP of your choice and having the ability to change ISP's if they are not performing to your satisfaction. Determining if the Town will work with the incumbent providers or consider a new provider will clarify ownership options.

Generally, there are four ownership models for the community to consider:

1. Owned and Operated by the community
2. Owned by the Town (either in part or entirely), operated by Internet Service Provider
3. Owned by investors, operated by ISP
4. Forming a public utility or becoming part of the MIDC

Cost

No matter what model you choose, providers will unlikely build out a system using their capital. The return on that investment (ROI) would take too long. For that reason, the current providers have not expanded (Spectrum) or improved (Consolidated) service in the community. Internet Service Providers will only take communities seriously if the Town is willing to explore public funding options.

| | |
|---|--------------------|
| Cost Estimate to serve every home* | \$2,495,562 |
|---|--------------------|

*Estimates are in several categories that may change the overall price of the project

Grants

There are various federal and state grant opportunities for the Town to consider. However, it is likely these opportunities would not be available for Spectrum served areas of the community. Given that some pockets are likely not served by Spectrum, identifying, and pricing those areas may create an opportunity to apply for state funding which we believe would be the most likely opportunity for success.

Why Fiber?

This section is intended to help community leaders and community members understand the benefits of fiber optics more fully. It explains fiber superiority over other technologies, including DSL and coaxial cable -- the two technologies currently used to provide internet service throughout the Midcoast and Maine. It contrasts the benefits of fiber optic over other emerging technologies, including 5G and Low Earth Orbiting (LEO) satellites.

Fiber Optic Glass Cable

History and Resiliency

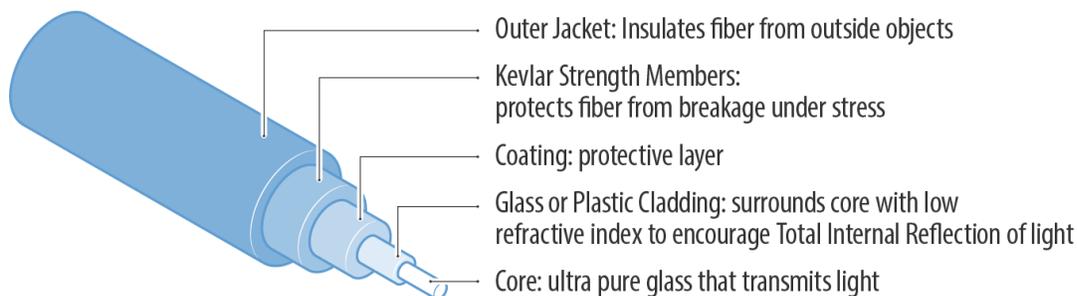
Dating back to the 1960s with the invention of the laser, Corning Glass Works created glass fiber that could transmit a light signal, not for centimeters but miles. Fiber optic cable technology has any communication medium's highest capacity and longevity.

Regarding capacity, Susan Crawford, in her authoritative book [Fiber: The Coming Revolution and Why America Might Miss It \(Crawford\)](#), observes that "a single fiber optic cable can carry the entire weight of data on the internet." (Crawford at 22) One single strand of glass can carry three billion phone calls or web sessions. (Crawford at 27)

Regarding longevity, fiber optic cables installed 40 years ago in cities around the world still maintain high-quality performance. Glass fiber is stable. It can withstand use without any degradation for decades. (Crawford at 27)

The Mechanics

An individual optical fiber (the size of a human hair) is surrounded by several layers of material that strengthen and protect the fiber, making it virtually indestructible. A fiber-optic cable can contain any number of "fibers" ranging from one to several hundred.

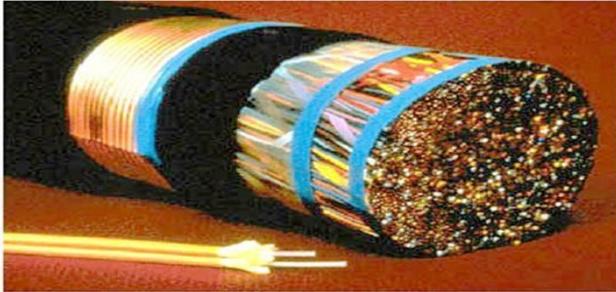


Fiber Optic Network Systems: The Best Choice for High-Speed Internet

Internet and communication systems installing fiber optics are designed, engineered, and built for decades of future use. Broadband committees, regional municipalities, and state agencies are often asked about the differences between the available network technologies and why fiber technology is a more desirable network solution.

- Fiber supports the increasing demands of 21st-century technology and provides associated economic opportunities
- Fiber advances communities and users by providing high-speed symmetrical connectivity

- Fiber, over the long run, is a less expensive technology, yet it represents a valued asset when community-owned or operated by a regional municipal utility
- Fiber represents a tested and reliable long-term investment in a community's future



The optical fiber cable in the foreground has the equivalent capacity of the copper cable in the background.

Just one visual example will underscore the capabilities of a fiber connection versus a legacy copper network connection. With today's technology, one fiber -- the thickness of a human hair -- can carry more data than 4,000 top-speed DSL lines.

Contrasting DSL and Coaxial Cable

Homes that are served by copper, either through DSL from the phone company or with coaxial cable from the cable TV. company, have significant limitations in service because of how each technology works.

DSL

In the case of DSL, the driving technology is outdated. The old copper lines (sometimes called "twisted pair" because they are made of pairs of copper twisted around one another) are susceptible to corrosion that severely impacts the reliability of a subscriber connection. Furthermore, the distance DSL can push a signal is limited to 3 miles. Those homes furthest from the telco equipment face connections that often cannot reach even an inadequate 3Mbps of download speed.

Coaxial Cable

In the case of coaxial cable (coax), used by TV. cable providers, capacity is also an issue, but for different reasons. Coaxial cable is not as scalable as a fiber-optic system—for every step up in speed, equipment needs to be upgraded both at the home and the cable plant. Furthermore, cable systems were designed primarily to push data down to the customer (e.g., delivering television to the home), an appreciably different model than the emerging data needs for telecommuting and interactive video, which require high bandwidth in both directions (referred to as symmetrical download and upload speeds). Finally, of significant concern, cable is a shared system, meaning that the signal strength any individual user receives depends on how much bandwidth is being drawn by other users connected to that line of cable. Cable companies commonly oversaturate their subscriber networks, leading to inconsistent speeds for the end-user. Additionally, a user's distance from the node or box where the coax is connected will also dictate the speed a user receives. This explains why some users in relatively short distance from others receive very different speeds regardless of the number of users on the system at any given time.

Competing Wireless Technology

There are two types of wireless options, fixed and satellite. While neither of these technologies can deliver the speeds and reliability available with fiber optic, they play a role in today's technology options. It is important to identify the specific uses where they may be valuable and fully understand the limitations.

Fixed Wireless

Wireless service is not as reliable as fiber optic and can be susceptible to weather conditions and movement of outdoor equipment due to wind. Most wireless systems require a direct line-of-sight; obstructions (e.g., trees, water, granite) interfere with and can disrupt wireless signals and service. Reliability concerns and reliance on line-of-sight make wireless installations best suited to dense urban areas or specific rural locations where the physical environment makes other solutions unachievable or not financially viable. In the case of the Midcoast region, wireless connectivity is serving some homes. Given its limitations in speed, geography, and lack of dependability, a wireless system that can support ever-increasing bandwidth demands would be a lower-tier consideration or a specialty last mile application.

5G

Touted as the next great technology, 5G is increasingly a consideration in major urban markets where the density of buildings makes fiber optic installation expensive and complicated. But 5G is many years away from being implemented in rural Maine. As Crawford notes, 5G mobile wireless connections will be "extraordinarily useful add-ons to fiber" but they "depend on fiber being installed everywhere." Crawford predicts that to bring 5G to fruition, we will need 20 times the number of fiber-backed cell towers and cell installations that exist today, every 15,000 feet or so, deep into neighborhoods and towns. (Crawford at 28) In summary, 5G systems rely on a robust fiber infrastructure system to power the system. Therefore, the emergence of 5G will one day supplement the Midcoast region's fiber infrastructure—it will not replace it. Midcoast 5G deployment can and will depend on the fiber infrastructure being built by Midcoast Internet. Fiber and wireless should be viewed as complementary—not competing technologies.

Traditional Satellite

Hughes and ViaSat are examples of two satellite internet providers available in the U.S. This technology is expensive, slow, suffers from lag and inclement weather interruptions, and has tiny data caps. Residents often augment their satellite connections with mobile hotspots to ensure they are always connected, but at a tremendous expense – sometimes as much as several hundred dollars a month.

LEO Satellites

StarLink is a type of satellite technology called LEO or "Low Earth Orbital," where the satellite sits closer to the Earth than traditional geosynchronous satellites like Hughes or ViaSat. In theory, this proximity allows LEOs to provide faster and more robust service. While trials suggest StarLink provides speedier service, upwards of 100/20 in certain communities, these speeds pale compared to the promised gigabit speeds. Still, StarLink appears to be capable of speeds that have been unattainable with traditional satellite internet and to regions where no wired or fiber connection exists.

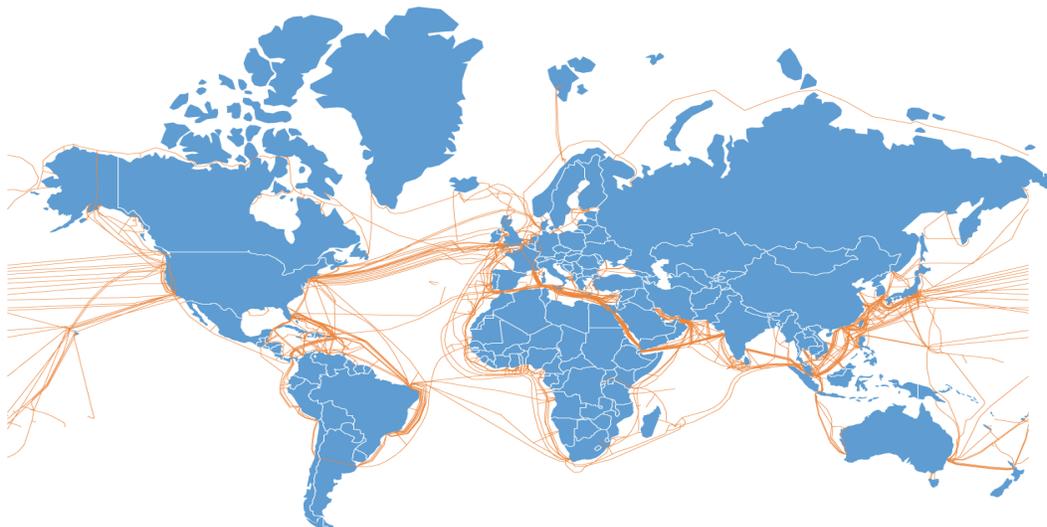
Obstacles to LEO implementation in Maine include LEO service requiring a clear view of the sky to stay connected. Any object obstructing the line of sight between your home and the

satellite, such as a tree branch, pole, or roof, will cause service interruptions. Customers find that a permanent mount in an elevated location, like a roof, pole, or wall, provides the best installation and service. LEO in today's market with current technology is suited for vast open areas where connectivity is unreliable or completely unavailable.

Summary

- Fiber is the network standard and best consumer and community choice due to its reliability in consistently high speeds, long-lasting duration, and resiliency.
- An MIDC or publicly owned fiber network will assist in social equity and inclusion by helping to close the digital divide through universal access and affordable service options.
- Fiber allows for symmetrical upload and download speeds, allowing all users to share files and communicate seamlessly.
- 5G and low earth orbit satellites are years away from effective rural deployment and will not meet the same reliability and capacity that fiber currently has. It is essential to remember that those technologies remain dependent on a robust fiber optic infrastructure.
- Fiber is the only technology with unlimited bandwidth capacity, making it a future-proof investment.

Axiom Recommendation: Proceed with Fiber Optic Broadband--The Key to High-Speed Connectivity



State-of-the-Art Technology

Fiber optic systems represent "state-of-the-art" technology, and their data delivery networks provide fast, reliable, and future-proof internet, data transfer, and communication services. With trillions of dollars of fiber infrastructure installed worldwide, the global economy has developed utilizing a fiber backbone. To ensure its fullest capacity, the information and data technology industry has proven to be highly adept at developing new electronics to push more and more data through existing fiber lines.

This same advanced fiber technology is now available to serve homes and businesses in rural and urban areas throughout the United States and right here in Maine. Fiber-to-the-Premise (FTTP) networks are being rapidly deployed. Multiple fiber networks are in the Portland area and Downeast Maine. Others are planned to be built in the years ahead, including the Maine communities of Georgetown, Millinocket, Roque Bluffs, Southport, and Searsport (and many others). The extensive network of fiber already installed and the nationwide focus on building out fiber demonstrate the technology's superiority. With virtually unlimited capacity, multiple-decades longevity, and extremely low maintenance, there is a significant shift in market forces that make fiber optic the dominant and preferred choice.

The Cushing fiber optic system will provide a dedicated fiber to each premise. The equipment in the C.O. will deliver up to 1/1Gig of service (1000Mbps/1000Mbps) to EVERY premise on the network and throughout the community. Connections to the system can be upgraded to 10/10Gig (10,000Mbps/10,000Mbps) as future bandwidth needs increase. The system will include ports that will currently deliver this speed level should the communities attract a business or research center that would require ultra-high-speed connectivity. The MIDC CORE 4 project would be compatible with the same network elements and equipment.

A concern with fiber optic systems is the up-front cost. However, over time, other technologies will need to be replaced, upgraded, or as seen in Midcoast Maine, deemed obsolete. On the other hand, fiber will allow both Cushing and MIDC to provide the bandwidth required by new applications in the years to come while using the same fiber distribution network for decades.

Consumer Benefits of Midcoast Internet Fiber

Speed and Capacity

Experts say that fiber optic is the only technology with enough bandwidth to support projected consumer demands over the next decade. The average home has multiple connected devices now, and the number of such devices is expected to grow. According to Deloitte, the average home has 25 internet-connected devices, up from an average of 11 in 2019. Deloitte defined connected devices to include laptops, tablets, and smartphones; video streaming devices and smart TVs; wireless headphones and earbuds; gaming consoles and smart home devices; and fitness trackers and connected exercise machines. But the list continues to grow with home appliances, GPS trackers for devices, pets and more.

Future Proof

Because of fiber's capabilities, new technological innovations are being invented daily to utilize its superior ability to transport tremendous amounts of data at blazingly fast speeds. The ways we use the internet at home and in our businesses that seem commonplace now were, in many cases, not even conceived of five years ago. Moving forward, technologies such as 3D holographic 4K television and 8K immersive gaming will be everyday items in Maine and households worldwide. The Midcoast Internet fiber-to-the-home (FTTP) network will handle the estimated 30 gigabit-per-second needs of such equipment.

One Delivery System

A fiber customer will receive telephone, video, audio, television, and almost any type of data transmission using a single seamless FTTP connection. That trend will continue as consumers have an increasing array of a la carte choices for communication, data, and streaming options. Subscribers will realize that receiving bundled services through a streaming fiber connection saves money.

Reliability

Fiber provides the most reliable connection for internet services. In surveys across the state of Maine, the #1 complaint about internet service is reliability. An internet connection is a necessity, not a luxury. When connectivity is interrupted or slowed down unexpectedly or inexplicably, consumers are furious that they cannot accomplish basic online tasks, leading to a significant loss of productivity and time. As discussed above, fiber's reliability is far superior to all other technologies.

Community Benefits of an Internet Fiber Network

Closing the Digital Divide

A driving force of the MIDC and its community-owned network is its unique position and ability to address equity and inclusion. In Cushing and like-minded communities of the Midcoast region, far too many people are without access/connectivity or know how to utilize and benefit from the technologies associated with a broadband connection.

MIDC has a commitment to

- Universal access to all residents and businesses;
- Providing the tools, training, and personnel for community education and outreach programs; and
- Making available robust and affordable broadband solutions for all income and opportunity levels through assistance funds, low-income rates, subsidized rates, and free hot spots.

These efforts will help close the digital divide and improve the daily lives of people most in need throughout our communities.

Job Creation

Fiber networks create jobs by supporting existing businesses and attracting new ones. Having the requisite broadband availability opens up the opportunity to develop new lines of

business for Mainers, e.g., customer service representatives for major corporations, tech support, and all bi-directional communication and service industries that will place Maine workers on a par with job opportunities in more densely populated portions of the country.

Business Attraction

Business attraction means providing the connectivity and I.T. backbone for businesses that quickly move large amounts of data--architects, designers, media companies, banks, online retail businesses, medical specialists, and other heavy users. With high-speed broadband access, companies and professional offices can relocate to the Midcoast area—a trend that we are seeing across the nation resulting from the pandemic and demographic trends already underway.

Telemedicine

The medical field and how patients and providers interact is undergoing seismic change. One of those changes is how patients are treated, monitored, and increasingly given tools to manage health care from their homes. A fiber connection has the symmetrical download and upload capacity, facilitating our elders aging in place, relieving an increasingly burdened health care system, and ensuring medical access to remote Maine areas even during winter months when roads are less passable.

Telecommuting/Entrepreneurship

As remote work has changed from a luxury to a necessity, having a consistent and robust connection is crucial, especially when uploading from home to the internet. The technology of fiber makes it ideally suited for telecommuting. Virtual meetings, cloud sharing documents, scheduling, and a host of other applications are made seamless with a fiber connection. While telecommuting is important to temporary and seasonal Maine residents, remote work has become a necessity to the recent population changes we see in Maine.

As a result of demographic shifts in the U.S. and hastened by the Covid-19 pandemic, we are seeing entrepreneurs relocate to Maine full-time, as well as full-time staff workers, management teams, and executives of corporations, associations, and other entities. Fiber optic connectivity makes this remote work possible, further contributing to economic growth and opportunity for Maine.

High-speed connectivity plays a significant role in attracting and retaining Maine's "next generation" in an increasingly aging State, ensuring a more prosperous future for all Maine residents.

Education

Equal access through the universal connectivity proposed by the MIDC eliminates "the homework gap." Students who must complete assignments online but lack a fast, reliable fiber internet connection at home fall into that gap.

High-speed internet goes beyond closing the gap, providing access to a world of distance learning, including music lessons, museum tours, and interactive classes from around the globe. High school students can also access advanced opportunity and placement courses that allow them to jumpstart their college education.

Adult learners in programs like those co-sponsored by MIDC and the Mid-Coast School of Technology benefit from online learning options that utilize distance learning, interactive video, or other tools that require and take advantage of high-speed fiber connections.

Increased Home Values

A Broadband Communities study indicated that FTTH networks increase the value of a \$300,000 home by an average of \$5,000-\$6,000. Another study by the FTTH Council in conjunction with the University of Colorado showed that homes with an FTTH connection are worth, on average, 3.1% more than homes that do not have a fiber connection. Conversely, areas with poor, unreliable internet service experience below-market home values.

Increasingly, Maine real estate professionals anecdotally report that the number one question of potential homebuyers used to be about the quality of the schools—now it's high-speed internet access. Not only are home values increased by high-speed internet connectivity, but we are also increasingly seeing a world where homes will not sell to many buyers without it.

Incumbent Providers

Over the next few months, the committee will need to gauge the community's interest in working with one of the incumbent providers or invite a new provider into the community. Either solution offers both pros and cons to achieving a town-wide broadband solution.

Spectrum

Spectrum has worked with a handful of communities to build out their system. Spectrum will sometimes work with a town to expand their current service, meaning they would expand

their co-ax copper-based cable system to homes they currently do not serve. But Spectrum is unlikely to install fiber as part of an expansion of service. Also, Spectrum is unlikely to expand service to areas that they would deem unprofitable. In areas where they are willing to expand, Spectrum often prefers to have a blended approach to funding the expansion, applying for state funding, using some of their capital, and making up the difference with money from the Town they are serving. Spectrum has never entered into any agreement that would not give **them** 100% ownership of any new expansion. Their offerings to communities are changing, and they have recently offered an opportunity to bring subscribers up to 1Gig of service. Spectrum will "upgrade" their current systems in the community so that everyone can receive a 940/30Mbps connection. In some areas, they will expand their network to reach customers currently not served. They will charge a bulk fee to the Town of \$24.99-\$40+/per HOUSEHOLD or per subscriber, which will be billed on a scheduled basis directly to the Town. Costs vary per Town based on the infrastructure upgrades and expansion. The Town is responsible for billing customers directly. Third-party billing can be set up at an additional cost. All existing customers are automatically switched to this service and bundled customer will keep their bundle pricing through Spectrum.

- We are not aware of Spectrum including a commitment to build to every home
- Billing the Town for each subscriber to achieve a shaky Gig, regardless of whether a subscriber wants that level of speed is an issue that needs careful consideration
- A Town is typically not equipped to handle billing 100s or 1000s of subscribers
- The service offered does not provide symmetrical service and will still operate on coaxial copper cable, not fiber optics
- The Town might be obligated to pay for resident services that are never reimbursed by the resident, therefore, leaving the debt with the Town and other taxpayers
- We suspect this option to be much less expensive than building a new system with any other partner

Consolidated Communications (CCI)

CCI has begun work with communities that inquire about replacing existing Consolidated DSL systems with fiber optics. Consolidated recommends that the Town consider issuing an RFP outlining its design requirements and standards, asking for a complete engineering cost estimate. Because CCI owns a good part of the utility pole infrastructure and can accelerate make ready, they can be a choice to consider because the cost to construct can conceivably lower.

It is not clear if CCI would be interested in working with your community or if the community would be interested in working with Consolidated, so this option would require a significant amount of due diligence by both parties to consider if an arrangement makes sense.

Working with incumbent providers -either Spectrum or Consolidated- can be beneficial in marginally reducing some risks to the Town. Consumers may feel strongly about the Town owning the infrastructure, preferring instead a more traditional approach where the ISP controls all aspects of the customer experience and is fully responsible for expanding service. In CCI's case, they are not interested in any other arrangement than full private ownership, which is disqualifying for some. Towns can be uncomfortable helping a private company with public dollars.

Ownership and funding a private company drive the community to consider creating a relationship with a new provider that could provide more favorable terms, better reach the goals of the Broadband Committee, meet the needs of the community, and allow the Town to own the

Network. This model is a pathway for the community members to have a stronger voice in network management and internet service delivery in their Town.

Action Item

- As part of the Town's due diligence, reach out to each incumbent provider (unless already done) and discuss interests and options

Benefits of a Broadband Utility

The Midcoast Internet Development Corporation is a group of like-minded communities working together through a regional utility to build and operate an open access publicly owned network successfully. A community-driven open-access network is an exciting opportunity that can bring tangible benefits to subscribers in potentially lower pricing, better response times to issues, and a community-minded experience that a user is part of a project that benefits many. The participating communities have much better control and collaboration with ISPs that want to operate on the network and ultimately can make the rules on how ISPs behave and operate with subscribers. Because of the scale of the project, MIDC managing directors are always considering how to build out the network best. Some of the smaller communities have been told that they would likely be part of Phase II. In Cushing's case, you may not be willing to wait, but being municipally owned would keep this option open to the community should they consider joining the utility in the future.

The Institute for Local Self-Reliance, among other areas of interest, is focused on open access and municipally owned networks. Located on the web at: <https://muninetworks.org>, the website offers significant resources for communities considering muni networks. Peer to Peer learning, podcasts about various issues, and locations of muni networks across the United States are a small sampling of the resources available on this site. As you consider a relationship with MIDC or your municipally-owned network, the Institute offers a wide variety of resources that can help you better evaluate and understand this opportunity.

- A Broadband Utility helps mitigate risk by spreading out the cost across multiple jurisdictions
- A Broadband Utility can provide enough scale to attract multiple new providers
- A Broadband Utility can use a variety of funding methods without direct taxpayer dollars
- Broadband Utility networks have the potential to generate long-term benefits beyond downward pricing and improved internet access
- A Broadband utility network in the Midcoast will be an excellent marketing tool to attract talent, jobs, and other economic benefits like increased established business productivity and profits
- A Broadband Utility can help unify how to address the affordability gap in each of the communities

In short, a multi-town Broadband Utility can bring tangible benefits beyond a single community's efforts. The economies of scale and the increased power of size, while still being hyper-responsive to the communities they are serving, is a powerful incentive to give Midcoast Internet Development Corporation strong consideration.

Benefits of Public Ownership

Public ownership models are increasing in popularity, and several communities have implemented this approach because of the benefits of aligning and assuring that the ISP meets community goals. This model is a pathway for municipal leaders to have a stronger voice in what is happening in their community. While this model increases the Town's responsibility, it also provides a much more collaborative approach with the ISP, which brings better customer experiences and the ability of the Town to change providers if service agreements are not met. These changes in the relationship foster a better partnership where the ISP is much more accountable to the user experience, and the community is much more committed to mutual success for both the Town and the provider. Several Maine communities have implemented this approach. There are a number of communities in the planning stage of becoming the public owner of a broadband internet system that will be implemented over the next year.

The following represent real-world examples of various ownership models:

Owned and Operated by the community- Islesboro

Islesboro model was the first in Maine and featured several unique aspects.

- The Town issued a \$3.8M bond to fund construction
- 600 premises connected
- Town contracts with GWI to run the system
- Town maintains a list of subscribers and interacts with stakeholders billing is \$360/year for a shared Gig of service across the community
- They have a volunteer committee to oversee the network

Owned by Town, operated by Internet Service Provider- Cranberry Isles

The Town successfully received a grant to pay for the system but has not yet received the funds.

- Town paid through property taxes the cost of the build \$1.2M across 4 of the islands that make up the Cranberries
- To date, 180 premises connected
- Town entered into a long-term Public-Private partnership agreement with Axiom
- Axiom does all billing, maintenance, and tech support
- Axiom returns 5% of gross revenue to the Town
- Various tiers of service, the system is capable of 1Gig/1Gig to each home

Owned by island investors, operated by ISP- Cliff Island

Currently one of two models in Maine that private investors own. Because Cliff Island is part of Portland, and Portland did not want to support the effort with municipal dollars, a group of islanders raised \$350,000 from fellow islanders to pay for the fiber network, which was wired on the ground across the island to every home.

- Private investors are getting paid back by receiving \$240/year for each subscriber
- Approximately 80 subscribers
- LLC entered into a 10-year agreement with Axiom
- Axiom does all billing, maintenance, and tech support

Forming a public utility- Downeast Broadband

Calais and Baileyville have created an open-access network envisioned to attract multiple providers to service the approximately 2900 homes passed. Currently, Pioneer Broadband is the only operator on the system.

- Towns took out a bond to pay for the system
- Payback is expected through the fees collected by ISPs on the system
- Maintenance is performed by contract with Pioneer Broadband
- A utility board oversees the system
- 2900 homes passed

Elements of Strong Partnership Agreements

Municipal responsibilities

- Own and insure the main backbone and fiber equipment
- Work closely with ISP on marketing efforts and take rates
 - Promote ISP and early commitments to the new system
- Commit to a long-term contract with the ISP to exclusively serve the community
- Develop and maintain expectations for ISP engagement and pricing for citizens

ISP responsibility

- Repair and maintain fiber drops and home equipment at their cost
- Employ a local representative to support timely responses to customer issues
- Coordinate all operational and managerial responsibility for the system
- Return a % of gross revenue to the community
- Maintain proper insurance as required of an ISP

Determining if public ownership is the preferred approach will be vital to decide what next steps are taken. The Broadband Committee should have a committee meeting to discuss the potential options for a municipally owned model and bring these options to the community.

Ownership Model Pros and Cons

| Private Ownership Benefits | Private Ownership Concerns |
|--|--|
| The Town would not be responsible for anything; all responsibility would be on the ISP | It is almost a certainty that a public subsidy will be required to build out, so public money would be used to fund a system the Town would have little to no control over |

| | |
|---|--|
| This is a model that Spectrum & Consolidated traditionally use- so if the Town works with an incumbent, this is the model to expect | While reducing risk, private ownership also cedes any leverage for pricing or customer service expectations to the incumbent |
| Keeps the status quo | If you like what you got now, no change |
| Updated and increased coverage to underserved parts of the community | Must insist that they serve every home- they typically are not willing to do that |
| In Spectrum's case- the community would retain a cable TV option | Spectrum is expensive, and traditional cable TV is slowly dying as people buy their content through subscription streaming services accessed through their internet connection |

| Public Ownership Benefits | Public Ownership Concerns |
|--|--|
| Locally owned means the Town and the community are committed to its success. This typically drives additional takers of the service. | The Town takes on additional responsibility |
| The Town has control over which ISP they choose and can change ISPs, and work to create reasonable pricing- in short, the Town will have the leverage! | With Town leadership changes over time- having consistent Town oversight of the intent and purpose of the original goals can be a challenge. |
| The Town can insist on fiber optics- and not worry about becoming obsolete for 20-30, even 40 years | Fiber can be 30% more expensive than other technologies to build |
| Saves money over the long run- long term investment- can avoid much of make-ready cost-saving 100s of \$1000s during construction | The cost of the system may not be fully covered by the revenue generated by the subscribers, requiring additional support |

Recommendations

- The Broadband Committee should discuss the potential options for a municipally owned model
- Strongly encourage you to investigate the viability of a Midcoast Internet Development Corporation partnership
- The Committee engagement of the current providers should help determine their interest in expanding service to the whole community and help inform the Broadband Committee and the community on the viability of a new service.
- The Committee should work with the community to set a clear goal about ownership and what the community would like to achieve
 - What are the elements of an ownership agreement that need to be addressed?

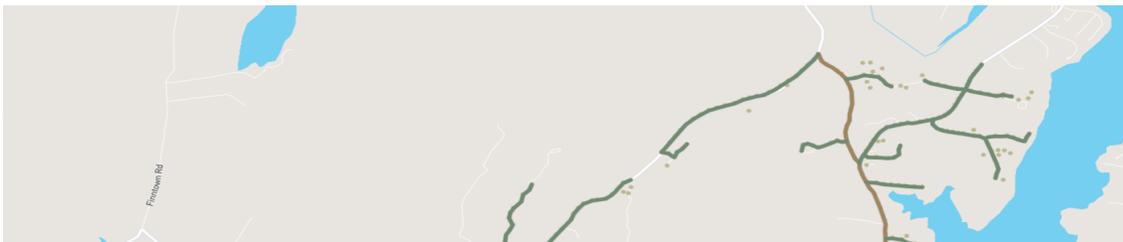
- o Is there anything unique about Cushing that can be leveraged in a relationship with an ISP?
- o What are the essential goals that need to be met? (e.g., Own your Own, Equal Access for All, Enhanced business service offerings, Low-income subsidy, etc.)

Construction Cost Estimates- Full Build

Our estimates are intended to be high-level, and significant due diligence will be required to obtain a final construction cost. We break these numbers down for you to review and ask questions about the components of our estimate.

The construction cost estimate would pay for a fiber connection to any home that wants to be connected. A calculation of expected revenues and expenses has been computed to illustrate the expected viability of the project, as well as the cost of servicing the bond that would fund the project, should the community decide to implement a municipal-owned system. Looking at the Financial Modeling section will help the Cushing Broadband Committee understand the Town's commitment.

The brown line is the main high count fiber trunk, while the green lines indicate smaller count fiber. While not depicted in this map, all private roads would have an opportunity to get service.



| | |
|--|--------------------|
| Total Construction cost-after potential savings | \$2,030,514 |
|--|--------------------|

| Category | Cost | Calculations | Assumptions |
|------------------------------|---|---|---------------------------|
| Licensing Application | \$51,818 | This is based on the number of poles and likely very close to the cost. | |
| Make Ready | \$291,750- potential to reduce or eliminated if municipally owned | Calc: 1167 poles x \$250/pole= \$291,750. | ESTIMATE- to be discussed |

| | | | |
|---|--------------------|---|--|
| Pole Replacement | \$87,525 | Calc: 5% pole replacement- \$1500/pole x 58 poles= \$87,525. | ESTIMATE- to be discussed |
| Central Office (Utility Hut) | \$250,000 | Includes all equipment inside to light up the system and a telco hut | Different designs will depend on location- this is for discussion to get you a better number |
| CPE/Customer install (326 customers) | \$146,700 | \$200 for home equipment and \$250 labor for install. Calc: \$450 x 326 homes= \$146,700 | Does not include a router, which we lease for \$7.50/month, or buy your own. |
| Construction of the main system | \$1,379,364 | All-in cost from the contractor for main lines and drops to the home | Labor and Materials- this would need to be verified with the construction contractor |
| Contingency- 10% | \$137,936 | | Pricing of materials rising-as is labor cost |
| Project Management (5%) | \$68,968 | Axiom fee for overseeing construction contractor, installing CO, as well as taking orders for service | 5% of overall project cost |
| TOTAL | \$2,495,562 | Includes all Make Ready | |
| | | | |

Explanation of Categories

Licensing Application, Make Ready, and Pole Replacement

All three of these categories relate to the process of applying for and receiving the approval to run fiber on the utility poles. The application cost cannot likely be avoided, even if you proceed as a municipally owned system. The cost of Make Ready should be reduced or avoided if you are municipally owned. Still, it remains unclear if you could avoid all or some of the expected pole replacements that may be necessary to run a new fiber cable. The law is vague on pole replacement responsibilities.

Central Office

A CO refers to the location where the central operating equipment would be housed. For simplicity's sake, we propose a new telco hut with heating and cooling and a generator to power the system in the event of lost power. We located the CO at the fire station- that can change, and therefore the design of the CO can change. If an existing indoor space or a different location better meets the needs or saves money, that design work can happen once the community settles on a site.

Customer Premise Equipment (CPE)

We have calculated a 70% take rate. This calculates to 326 homes on which we are basing our equipment purchase.

Construction Cost

The most significant expense, this number will need to be tested once we are ready and the project is approved and moving forward. As demand has skyrocketed, there have been increased costs to fiber materials, and the build's timing may also affect the price. Increased demand on construction crews, building in off-construction season can contribute to final pricing. It will not be apparent until the Town gets closer to hiring a contractor. We feel good about this number but have added a 10% contingency. Nothing is set in stone until a contract is agreed to and signed.

Project Management

There is an enormous amount of oversight, questions, and inquiries about these kinds of projects. If anyone has ever built a home, you understand the long list of decisions that need to be made- it's analogous to a fiber build project. Overseeing all of the decisions, ensuring that the community's goals are met, and gathering all of the necessary detailed information from all potential subscribers requires a significant effort.

Contingency

As mentioned in the construction cost estimate, there is an anticipated increase in the cost of materials and labor over the next year or more. We have included a 10% contingency to address any increases that may occur. However, it is also possible to find savings in other parts of the budget.

Potential Cost Savings

If your community were to embrace public ownership or elect to be included in MIDC, there is potential to save some cost. In addition, any area not served by Spectrum could be eligible for state grant funding.

Some further cost savings could be derived depending on several factors:

- The condition of the utility poles (avoiding replacements)
- Construction cost approval and timing (avoiding the 10% contingency)
- Central Office location and placement in an existing building
- State funding for unserved locations
- Using local ARPA funds

| | |
|---|------------------------|
| Total construction cost estimate | \$2,495,562 |
| Reduced by: | |
| Avoiding Make Ready cost | \$58,350 |
| Reduced # of pole replacements | \$43,762 |
| Construction cost contingency | \$137,936 |
| Central Office changes | \$50,000 |
| State funding for unserved areas | \$75,000 |
| Local ARPA funds | \$50,000 (total guess) |
| Total potential savings | \$465,048 |
| | |
| Project cost to model | \$2,030,514 |

Revenue and Expense Modeling

Be aware that the Revenue and Expense modeling is just one set of assumptions based on our experience with over 25 planning processes and deployments of FTTH. Each ISP would have its own internal modeling and calculations. Below we have calculated a conservative take rate so that we are not challenged on being overly optimistic, although it is likely, at least in the unserved areas, that higher take rates may occur.

| Year | Total # of Homes Served | Revenue | ISP Expenses- includes payment to Town | Town payment from ISP- \$20 per sub/per month |
|------|-------------------------|-----------|--|---|
| #1 | 233 | \$129,751 | \$109,084 | \$39,600 |
| #2 | 251 | \$146,156 | \$127,539 | \$44,640 |

| | | | | |
|----|-----|-----------|-----------|----------|
| #3 | 275 | \$163,448 | \$151,569 | \$49,920 |
| #4 | 297 | \$182,522 | \$159,128 | \$55,400 |
| #5 | 326 | \$199,704 | \$166,687 | \$60,960 |

Take rate Assumptions:

| Year | Take rate |
|------|-----------|
| #1 | 35% |
| #2 | 40% |
| #3 | 45% |
| #4 | 50% |
| #5 | 55% |

Modeled below are the first five years of payments and revenues based on a total construction cost after savings of \$2,030,514. We encourage communities to consider municipal bonding to fund project costs that other funds cannot cover. It is the lowest cost of capital available, has good flexibility (you can activate interest only payments in the first couple of years while the project is getting started), and allows the Town to keep the liability off of its Town books.

**Maine Municipal Bond Bank
Estimate of Borrowing**

| Date | Principal | Rate | Interest | Total Payment | FY Total | Revenue | Gap/Surplus |
|------------|-----------|---------|----------|---------------|-----------|----------|-------------|
| 05/01/2023 | | | \$16,960 | \$16,960 | | \$0 | (\$16,960) |
| 11/1/2023 | \$83,556 | 0.0550% | \$17,055 | \$100,611 | \$117,571 | \$55,920 | (\$61,651) |
| 05/1/2024 | | | \$16,825 | \$16,825 | | | |
| 11/1/2024 | \$84,017 | 0.0580% | \$16,825 | \$100,842 | \$117,667 | \$60,240 | (\$57,427) |
| 05/1/2025 | | | \$16,581 | \$16,581 | | | |
| 11/1/2025 | \$84,503 | 0.0620% | \$15,581 | \$101,084 | \$117,666 | \$66,000 | (\$51,666) |
| 05/1/2026 | | | \$16,319 | \$16,319 | | | |
| 11/1/2026 | \$85,207 | 0.0680% | \$16,319 | \$101,346 | \$117,666 | \$71,280 | (\$46,386) |
| 05/1/2027 | | | \$16,030 | \$16,030 | | | |
| 11/1/2026 | \$90,892 | 0.0790% | \$16,030 | \$101,637 | \$117,666 | \$76,800 | (\$46,386) |

This report is an estimate only. Actual borrowing may vary.

There is no revenue in the first year of borrowing as that is the year needed to construct the tower. In the following years, you have a gap as the revenue return cannot cover the cost of the bond. However, the gap is not particularly big and shrinks as more subscriber revenue is derived.

Two critical levers significantly affect the viability of a project like this. First, the amount borrowed, and the cost of the borrowing will affect the yearly payback amount. You would

have to find additional savings or grant money to bring the project's price down to a manageable borrow amount that would allow the system to sustain itself without yearly taxpayer subsidy to cover the gap.

You will need:

- A willing ISP who is comfortable operating on a network that they do not own AND willing to give up to \$20/per customer/per month (\$240 per customer/per year) to partially cover the cost of borrowing \$2M
- The Town will need to aggressively search for grants and other dollars to reduce the total cost of the construction cost
- The Town will need to settle on a muni network to avoid make-ready costs

Benefits

- Minimum new taxes to fund the shortfall
- A generational investment that puts the community on the leading edge of communications, education, telemedicine, and entertainment content delivery
- Strong working relationship with ISP- able to replace if not performing

Risk

- Town responsible for payments of bond, regardless of revenue generated by ISP

Grant Funding

What can communities do now to get ready and anticipate grant opportunities- and what are the grant opportunities available? This section communicates several areas of focus that communities can work on now, so they are ready when grant opportunities are available. In addition, we have compiled a list of the grant opportunities we are aware of. This list should help your community investigate potential sources of funding.

Goal: Be Ready

Funding

Because most rural communities are governed through a town meeting, typically, a warrant needs to be developed and approved several months ahead of the actual meeting. For these communities, we suggest that you begin exploring the possibility of getting something on the warrant.

For communities with a Town Council, the funding timeline may be different. Still, just as importantly, all Broadband Committees should educate themselves on the process at council or town meetings. Often, funding opportunities don't line up with town processes, and opportunities can be missed simply because of timing.

We recommend having a community set aside a small amount of money; \$5000-\$20,000 have been amounts that other towns have earmarked that can be used on activities to create grant applications, install HotSpots, or used as a match for a future grant opportunity. In other cases, it was just as important to get language endorsing the work of a Broadband Committee and authorizing the Committee to explore all funding sources or to regularly report back on findings to town officials as to progress. All positive steps that can move the process forward.

Plans

Starting early engagement with any possible Internet Service Provider is very important. Building trust, agreeing to shared goals and roles and responsibilities will go a long way when opportunities arise to work together.

Goals

After looking at your town plan, you should consider and settle on your goals. "My internet stinks" is not a goal. Typically, communities that do well can articulate the answer to this fundamental question: Why? Why should the town focus on this? Why should we spend taxpayer dollars? Why is this important? The Broadband Committee must settle on their goals and articulate those goals not only to their town leaders but also to other citizens to build support. And speaking of support, I have mentioned this many times- find a champion- someone I like to call EF Hutton- if they talk, people listen. This person could be a town-elected official, but many times it's someone else who has significant influence in the community. This person can be critical to the success of any project. Start now and create a narrative for when you appear before the Select Board or Council and find a champion if you don't have one yet.

Explore the Criteria of Funding Opportunities

The Committees should look at each potential funding source listed below to see if the community can meet the criteria. Whether it's a cash match, or will only serve areas with minimal speeds, or a host of other eligibility requirements, many small communities are not used to the level of intensity required to apply for a grant successfully. Be prepared. Know the requirements and start assembling the needed documentation to give your community the best chance.

Advisory resources: Beyond Axiom, Peggy Schaffer, the Director of the ConnectME Authority, can be a good resource for communities. She is one person- be mindful of that- and can be reached at Peggy.Schaffer@maine.gov.

Island Institute is another excellent resource- Kendra Jo Grindle can be a great resource. As you get closer to implementation, she should be part of Committee discussions and support your efforts. She can be reached at kgrindle@islandinstitute.org

Grant Opportunities

The **ConnectMaine Authority** offers two types of grants- Infrastructure and Community Broadband Planning Grants. For this report, the planning grant is not a consideration. We would recommend looking toward an Infrastructure grant; details can be found here: <http://maine.gov/connectme/grants/>

Axiom has extensive knowledge of these grants and has received many of these grants totaling over \$1M.

- ❖ Grant proposals must meet the state standard of 100/100Mbps

- ❖ Grant limits are suggested, but typically \$100,000, which must be matched with a combination of cash and in-kind services
- ❖ The area targeted must be unserved or underserved (Service that is less than 50/10Mbps)

New grant round is to be opened this month, and the total amount available is expected to be between \$6M-\$7M. This will be highly competitive.

Maine Connectivity Authority is a newly established agency that will oversee new broadband investments in the state. The drive behind the new Authority is to manage the \$250M in new funding available to support rural broadband deployments in the state. Because the MCA is new, it's not exactly clear how they will work with the ConnectMaine Authority, what the new grant programs will look like or when new funding rounds will be announced.

- ❖ \$250M in new funding
- ❖ At least some of this money is expected to be available for projects in 2022
- ❖ Unclear on eligibility rules as they are going to be developed

The Maine Community Foundation has regional grants that can support initiatives up to \$10,000 a year found here: <http://www.mainecef.org/GrantsNonprofits/AvailableGrantsDeadlines/CommunityBuildingGrantProgram.aspx>

- ❖ Grants available up to \$10,000
- ❖ Local decision-makers by county
- ❖ Various criteria that need review
- ❖ Deadline February 15th of each new year

The Foundation also has grants up to \$15,000 for Community Broadband related activities, details of requirements can be found here: <https://www.mainecef.org/apply-for-a-grant/available-grants-deadlines/community-broadband-grant-program/>

- ❖ Grant Awards up to \$15,000
- ❖ Typically, ten awards every year
- ❖ Application deadline October 15th

Northern Border Regional Commission Grants located here: <http://www.nbrc.gov/>
The Commission accepts grant applications from across the northern border regions of Maine, New Hampshire, Vermont, and New York.

- ❖ Requires at least a 1 to 1 cash match
- ❖ Must be tied to quantifiable job creation
- ❖ Very competitive

Contact: Andrea Smith at (207) 624-9813 or andrea.smith@maine.gov for deadlines and program parameters.

Grant Funding Resources- Federal

Broadband in the Infrastructure Bill

- \$42 billion for states and territories to focus on unserved areas (this is the expected \$150M)
- \$14 billion subsidy for low-income users
- \$2.75 billion for Digital Equity and Digital Inclusion programs
- \$2 billion for USDA rural broadband programs
- \$2 billion for Tribal broadband
- \$1 billion for middle-mile connections

US Department of Agriculture (USDA) has several potential programs to fund Broadband expansion opportunities. The most important of these is the **Reconnect Program** which is now in its second round of funding. Details of the program can be found here:

<https://www.usda.gov/reconnect/program-overview>

We are anticipating the third round of \$1B available to be divided into three categories- 100% grant, 50/50 grant loans, and 100% loans. Each of these categories has slightly different criteria. This year Axiom was a significant contributor to two pending Reconnect applications.

- ❖ Extremely difficult to apply for with lots of different documents and eligibility requirements
- ❖ Most importantly, only 10% of homes in the proposed service area can have the capability of getting service of 10/1Mbps or higher
- ❖ Even in the 100% grant, the municipality or applicant is required to have a 25% cash match

After looking through the program overview and other details, please contact Mark Ouellette, the author of this report. He is familiar with this opportunity and can answer questions- mark@connectwithaxiom.com. Also available is the USDA Regional staff, Tim Brooks- timothy.brooks@usda.gov.

USDA-RUS Programs offer several other potential opportunities to investigate located here: <https://www.rd.usda.gov/programs-services/all-programs/telecom-programs>. By far, the easiest is the Distance Learning and Telemedicine Grants.

US Department of Commerce- **Economic Development Administration (EDA)** provides funding for economic development projects across Maine. Maine projects are reviewed and administered by EDA's local representative, Alan Brigham, at (215) 316-2965 or abrigham@eda.gov. Programs and eligibility can be found at www.eda.gov.

- ❖ Various funding programs
- ❖ Guidelines encourage regions to incorporate BB investments in their regional strategies (CEDs)
- ❖ Funding requires match
- ❖ No FTTH eligible

US Department of Commerce- **Broadband USA** is helping communities nationwide ensure they have the broadband infrastructure, digitally literate workforce and engaged citizens to thrive in the Digital Economy. Details can be found here: <https://www2.ntia.doc.gov/>

- ❖ Provides direct (one-to-one) assistance to communities

- ❖ Strong consideration should be given to the Broadband Utility Model that MIDC is building
- ❖ A municipally owned network is viable with the right ISP partner, but taxpayer subsidy is likely needed
- ❖ Some areas of your community should be eligible for state grants to help reduce the cost
- ❖ Working with incumbent provider can be a consideration, but you give up almost all control

QUESTIONS ABOUT THE REPORT?

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