



Town of Middlefield Communications Committee

Interim Broadband Report, 7-28-15

Introduction

The Middlefield Communications Committee has performed “due diligence” in examining last mile broadband alternatives since early fall of 2014, when WiredWest (WW) first made overtures to join its 44-town fiber initiative.

We have served as WW delegates and have reported on various WW and Massachusetts Broadband Institute (MBI) financial and technical presentations. After documenting the many areas in which the WW/MBI solicitations were unclear, we recommended that the town pass on the WW commitment deadline of January 2015.¹ The town agreed – as a citizen-sponsored petition to force a commitment was unanimously rejected at our annual town meeting in May 2015.

This interim report is to keep the town updated on our examination of several approaches to broadband connectivity, in our efforts to come up with a practical solution that is affordable to Middlefield taxpayers. These include:

- Generic fiber-to-the-home, with service provided by WiredWest, Crocker Communications, or Axia Connect.
- A hybrid fiber/wireless system along the lines of what is now being implemented in Royalston.
- An all-wireless system employing the latest available technology.
- Near future technologies, including 5G wireless and low earth orbit satellites.

We also examined related issues, such as bond financing risks. All documentation can be found on our town website, at http://middlefieldma.net/?page_id=5875.

¹ There is no financial penalty for waiting another year to sort out the complex last mile broadband issues and alternatives, as the MBI has assured us that we have even longer to decide without jeopardizing our state financial aid.

Contents

Introduction	1
Fiber-to-the-home (FTTH) financing costs.....	3
FTTH operational costs	3
Total FTTH financing and operational costs.....	4
Total FTTH cost including broadband service	4
WiredWest FTTH.....	5
Crocker Communications	5
Axia Connect	6
Hybrid fiber/wireless and all-wireless systems.....	6
Near future technologies	7
Bond financing risks.....	8
Preliminary conclusions	8

Fiber-to-the-home (FTTH) financing costs

At the December 2014 Financial Forum conducted by the MBI, the Franklin Regional Council of Governments and WiredWest, we were told that a fiber-to-the-home (FTTH) network covering the 44 western MA towns would cost an estimated \$100-119 million, including \$60-79 million in town funds.²

According to an email from MBI Director Eric Nakajima to the Middlefield Selectboard, the total cost to build Middlefield's fiber-to-the-home network would be \$1.59M.³ The email goes on to suggest that "you appropriate 1.01 M for the amount of debt to be authorized by your town. This figure reflects the benefit of your town's allocation of a share of available state grant funds." Moreover, the town should consider "administrative fees" to issue the bonds of approximately 3% for up to \$1M, or \$30,000 in Middlefield's case.

How will this \$1.01M be financed, and how will it be paid off? According to slide 22 of the December Financial Forum, the town would issue notes for a portion of the total cost in years 1 & 2, on which it would pay interest at the nominal rate of 0.5 percent. At the end of year 2:

- Town has the option of renewing notes into Years 3-4-5; pays interest plus minimal principal (approximately 3.8% of principal in Year 3)
- On project completion, town issues long-term bonds (assume interest rate 4%)⁴

Applying the above parameters to Middlefield's financing, the town would have estimated up-front costs of \$261,233 in the first five years (when there would be no prospect of revenues from WiredWest or another ISP), and total payments over the 20-year period would amount to \$1,448,142, or \$72,407 per year.⁵

FTTH operational costs

We have an idea of what the FTTH financing costs would be, but what about the operational costs? Here we are fortunate to have the *actual operational costs* for the recently implemented network in Leverett MA, which come to \$321,888 per year, or \$44.68 per subscriber per month.⁶

Middlefield's operational costs per subscriber will be higher, since its population is only 28 percent of Leverett's (521 vs 1876 in 2010) while its area is slightly larger (24.2 vs

² Last Mile Broadband Financial Forum, December 11, 2014, slide 4, <http://middlefieldma.net/wp-content/uploads/comcom/lastmile/december-financial-presentation.pdf>.

³ "Draft Article, Motion, and Ballot Question," email from MBI Director Eric Nakajima to the Middlefield Selectboard, March 4, 2015, <http://middlefieldma.net/wp-content/uploads/comcom/lastmile/2015-03-04-nakajima-to-selectboard.png>.

⁴ Last Mile Broadband Financial Forum, op. cit., slide 22.

⁵ Middlefield's Fiber Financing Costs, <http://middlefieldma.net/wp-content/uploads/comcom/lastmile/2015-07-17-MBI-fiber-financing.pdf>.

⁶ Crocker-Based Cost Estimates, <http://middlefieldma.net/wp-content/uploads/comcom/lastmile/crocker-plus-financing-cost-analysis.pdf>, p. 5.

23.0 sq. mi.). Thus, Crocker (Leverett's service provider) estimates that Middlefield's FTTH operational costs will be \$158,874 per year, or \$66.20 per month based on a very high take rate of 92% of Middlefield's 218 year-round residences.⁷

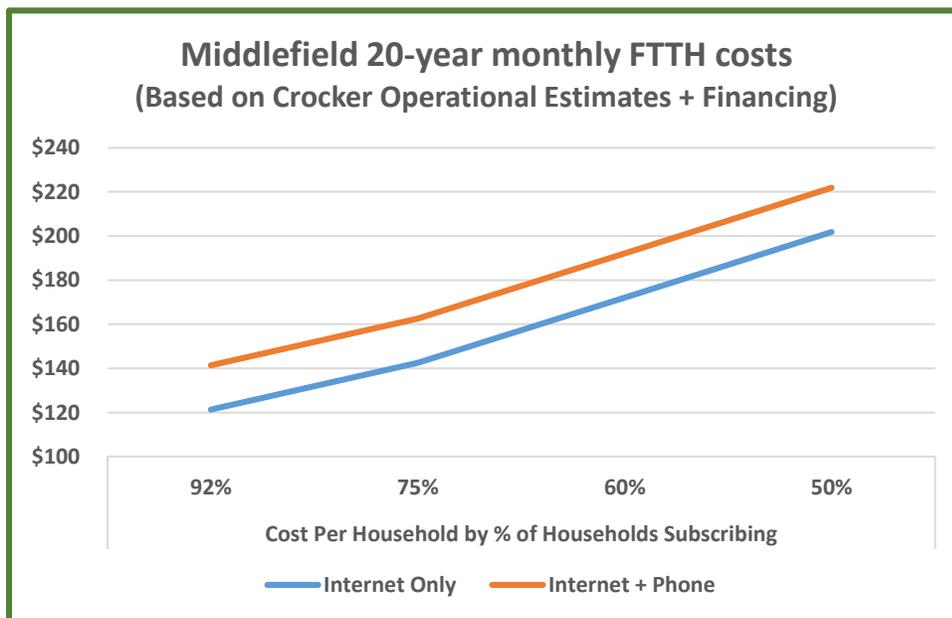
Total FTTH financing and operational costs

We can now combine Middlefield's FTTH financing and operational costs, to estimate total annual costs over the 20-year financing period of \$231,281 per year (\$158,874 + \$72,407). Applying that number to a 92% subscription rate (200 users), that comes to \$96.37 per user per month. For a more realistic subscription rate of 60%, the costs jump to \$147.13 per user per month.

Total FTTH cost including broadband service

Now that we've calculated the cost of building and maintaining the FTTH infrastructure, what about the cost of the broadband service itself – the reason for creating the infrastructure in the first place? Crocker charges \$25 per month for 100 Mbps broadband – a not unreasonable fee for an ISP.

When we add up the financing, operational, and ISP costs, we end up with a total of \$121.37 per user per month if 92% of potential users sign up. At a more realistic 60% sign-up rate, the total would be \$172.13 per user per month. Crocker charges another \$20 per month if you want fiber phone service. The final costs by take rate are shown in the following chart:



Clearly, these costs are unsustainable, without significant additional subsidies from the state or local taxpayers. For example, it's hard to imagine that many who have Verizon DSL + phone for \$79 per month, including taxes, could afford to switch to fiber costing \$172 per month (\$192 with phone).

⁷ *ibid.*, p. 1.

WiredWest FTTH

The WiredWest Fiber Cooperative Corporation, successor to the current WiredWest cooperative, is being formed to own and operate a regional network over fiber constructed by the MBI. Their draft business plan projects a year five 47% “take-rate”, at which “WiredWest can not only meet its operating expenses and reserve requirements, but can fully reimburse towns for the principal and interest payments on the debts they incur.”⁸

It is hard to understand how WiredWest can advertise “fast internet service of \$49 a month” and “100 Mbps superfast internet service” of \$79 a month⁹ when Middlefield’s operational costs + financing costs alone at a 50% take-rate are \$177 per household per month, before accounting for internet service. While Middlefield may not be typical of the proposed last mile towns – for example, Crocker estimates that Worthington’s operational costs would be \$15 less; Hawley’s \$21 more – it is unlikely that it would deviate by such an order of magnitude from the WiredWest average.

Should Middlefield join WiredWest Fiber, it would be committed to building a costly FTTH infrastructure as discussed above. In addition:

- It would have to transfer its assets to the cooperative.
- It would lose the ability to switch service providers should WiredWest be unable to fulfill its promises, such as 25 Mbps internet for \$49 a month.
- Should the project fail to generate sufficient TV, phone, and data revenues, taxpayers in member towns, including Middlefield, would be held legally liable for millions of dollars in up to 30-year bonds, plus interest, operating expenses, and any cost overruns “regardless of WiredWest operating results.”¹⁰

Crocker Communications

As a company that has served our region for over fifty years, as the predominant service provider on the Massbroadband 123 middle mile network, as well as the service provider for the town of Leverett, Crocker Communications brings a lot to the table when it comes to providing last mile service for Middlefield.

Crocker’s FTTH offering is essentially as described under the “generic” discussion above. This would include:

- Full maintenance of the physical infrastructure.
- 100 Mbps broadband for \$25 per month.
- Comprehensive phone service for \$29 per month.

⁸ Business Plan for WiredWest Fiber Cooperative Corporation, Working draft, June 25, 2015, <http://middlefieldma.net/wp-content/uploads/comcom/lastmile/ww-business-plan-06-25-15-draft.pdf>, p. ii.

⁹ *Ibid.*, p. 55.

¹⁰ *Last Mile Broadband Financial Forum*, *op. cit.*, slides 13 & 17.

- Combined broadband + phone for \$45 per month.

Crocker offers significant advantages over WiredWest FTTH:

- It is an established company that has brought communications services to our region for over 50 years, whereas WW has no experience whatsoever.
- The town would retain ownership of its assets, and would be free to switch providers.
- The town would not be liable for any Crocker operational expenses or cost overruns.
- 24/7 365 customer support.

However, Crocker would not resolve the central issue of the high cost of building and operating a FTTH network.

Axia Connect

Axia, which maintains and operates the MassBroadband 123 middle mile network, proposes to design and build a FTTH network with 100% coverage. In exchange for allowing them to be the exclusive internet provider for 20 years, they would:

- Invest \$600 per premise.
- Invest in & install required electronics.
- Invest in & install fiber drops to premises & equipment as customers sign up. (Customers to finance remainder of drops in excess of 300'.)
- Invest in required MassBroadband 123 backhaul services.
- Provide network management, maintenance & customer support.
- Provide 100 Mbps internet for \$49 per mo. on a two-year contract. (There would be a one-time setup fee of \$100.)
- Allow free access to other ISPs wishing to provide phone or TV.

Detailed cost estimates are forthcoming, now that town has signed a Letter of Intent. While the net cost of the Axia installation may be less than for the FTTH alternatives discussed above, the town would still have to raise all additional capital beyond last mile funding from state. There is also a question as to whether the Axia system would be eligible for town's share of the \$18M MBI has designated for professional services.

Hybrid fiber/wireless and all-wireless systems

Upon receipt of further Axia details, our examination of FTTH alternatives will be drawing to a close. We therefore determined to turn our attention to less costly wireless and hybrid alternatives.

We recently met with the Royalston Broadband Committee to discuss their implementation of a hybrid fiber/wireless broadband solution:

- It is being built at approximately one-half the cost of the all-fiber solution advocated by WiredWest and the MBI.
- It can be implemented in a matter of months, not years, and will immediately generate self-sustaining revenues.
- They are investigating FirstNet synergies.

We will monitor results from the first stage of Royalston's hybrid implementation this summer and fall.

In following up with Fred Goldstein of Interisle, Royalston's technical consultant, we were astonished to discover that the MBI had already contracted Interisle to conduct a study of wireless, and hybrid broadband options for Middlefield! ¹¹

The Selectboard has applied for an MBI Broadband Planning Assistance Grant to update the Interisle study to incorporate the latest technologies and town-supplied data & requirements. Once the application is approved, we will work with Interisle to spec out details and costs of various hybrid and wireless alternatives.

As noted earlier, the MBI projects Middlefield's FTTH deployment costs to be \$1.59M, with \$1.01 in town financing. The remaining \$580,000 would, apparently, be financed by the state. If Middlefield, like Royalston, could cut deployment costs in half with a hybrid solution – to \$795,000 – the net cost to the town would be reduced to about \$215,000 (\$1.59M/2 - \$580,000). If an all-wireless solution could get deployment costs down to \$580,000 or less, the project could be wholly financed with state funds.

Near future technologies

Given the torrid pace of technological advances and the rapid switch from fixed to mobile communications, especially among the young, any 20-year investment in fixed last mile technology would appear speculative, at best. It therefore behooves us to investigate near term technologies that could displace existing infrastructures, including:

- **Low earth orbit satellites:** the OneWeb deployment of 648 low-orbit satellites scheduled for operations by 2019 could prove to be an ideal solution. Specifically designed for underserved rural areas throughout the globe, it will deliver high speed broadband to low-cost CPEs (consumer-premise equipment), together with connectivity to existing mobile networks.
- **5G wireless:** wireless technology continues to evolve, with ever-increasing capacities and speeds, and the opening up of more spectrum by the FCC. Near term possibilities of say, working with an upstart like T-Mobile, should not be overlooked. (This service is provided on a nationwide or regional basis and should not be confused with locally initiated wireless connectivity.)

¹¹ *Fiber, wireless, and hybrid broadband options for Middlefield*, <http://middlefieldma.net/wp-content/uploads/comcom/lastmile/mbi-middlefield-fiber-hybrid-wireless-study.pdf>.

Bond financing risks

While it is beyond our scope to investigate these issues, our discussions with the Worthington FINCOM helped us to identify several potential bond financing risks:

- Few towns qualify for the “State Qualified Bond Program,” or would qualify for issuing long term bonds in national financial markets.
- Alternative “State House Notes” that WW has proposed are not bonds but relatively short term financing for smaller projects used to avoid the need for bond counsel and a financial adviser.
- Repeated issue of one-year state house notes is a temporary fix, as it would require conversion to long-term financing after five years.

Preliminary conclusions

Our preliminary conclusions regarding various technologies discussed:

- **FTTH (fiber-to-the-home):** we are awaiting further details on the Axia proposal. FTTH provides near unlimited speed and 100% coverage, but would cost 2-3 times as much to install as other studied technologies.
- **Hybrid fiber/wireless and all-wireless systems:** these are promising near-term solutions with relatively quick payback that could be implemented at relatively little or even no cost to the town. The downside is limited data rates and possibly incomplete coverage. We will be conducting further studies with Interisle to determine feasibility.
- **Near future technologies:** while it is beyond our committee’s scope to investigate near-term technologies, it should be incumbent on the MBI to study these alternatives and make recommendations to legislators and towns.

Once further information from Axia and Interisle is received, we will be able to wrap up our study and present our comparisons.