City of Madison Fiber-to-the-Premises Feasibility Analysis
CTC Technology & Energy, Kensington, MD

Condensation of the Executive Summary

Why The CTC Report

The City of Madison is in the process of evaluating the feasibility of a citywide Fiber-to-the- Premises ("FTTP") project to make very high-speed broadband service available to the entire Madison community. As part of that effort, the City has engaged CTC Technology & Energy to provide a Fiber-to-the-Premises Feasibility Analysis ("CTC Report"). This report represents the City's compliance with Wisconsin state law (Wis. Stat. § 66.0422(2)(c)), which requires any municipality that seeks to offer broadband services to conduct a cost-benefit analysis. The CTC Report meets the statute's report requirements, providing an in-depth and comprehensive analysis of the costs and benefits of a citywide FTTP project, considering various possible project scenarios.

Background

The City has been engaged in developing public access to broadband for some time. The Metropolitan Unified Fiber Network (MUFN) is a quasi-public consortium that collaboratively received a $5.1 million grant in 2009 through the federal Broadband Technology Opportunities Program (BTOP) to construct a robust backbone fiber network in the Madison area. MUFN currently provides high-speed broadband connectivity to the City's schools, libraries, fire stations, and other public buildings. The MUFN fiber extends to all areas of the City.

In 2013, the City created the "Digital Technology Committee" to advise the Mayor and Common Council on how the City currently uses and can improve upon its use of digital technology. One of the Committee's prime focuses is the "digital divide," which is the disparity between those who have access to modern information and communications technology and those who do not.

Bringing access to traditionally underserved populations is only one key driver for the City's broadband initiative. The City also understands that filling broadband service gaps is important to support robust economic development efforts, particularly for small and medium-sized businesses whose needs are not met with residential-grade service offerings, but that cannot afford traditional business-class service.

In late 2014 the Common Council approved funds for a two- year pilot program aimed at bringing broadband Internet service to residential customers in four low-income areas in the City. The following spring, the City issued a request for proposal (RFP), which led to an eventual contract with ResTech Services, LLC.

The pilot is an initiative designed to serve vulnerable populations who may never previously have had access to broadband service—either because there was no service available in their area, or because they could not afford it. The pilot program will offer 10 Megabits per second (Mbps) service at $9.99 per month. The four pilot areas are: Allied, Brentwood, Darbo-Worthington, and Kennedy Heights.

While the pilot program was initially envisioned as a wireless deployment, the City broadened its RFP to allow for alternative technologies. ResTech proposed an FTTP approach that would enable it to offer retail services to pilot customers by expanding the City's MUFN network infrastructure into the pilot areas. The program was originally intended to produce data to inform a cost-benefit analysis, which could potentially be used to pursue citywide broadband deployment.

After the initial stages of the pilot program were underway, Mayor Soglin determined that the City should consider a citywide FTTP initiative sooner than originally anticipated, and tasked the Digital Technology Committee with exploring this possibility. The Digital Technology Committee formed the Citywide Broadband Subcommittee, which engaged CTC to develop a cost-benefit analysis for citywide FTTP deployment.

There are several possible approaches to deploying broadband in a community; the City aims to determine which of these options—if any—makes sense for Madison's residents and businesses. Accordingly, the City tasked CTC to explore whether the City can feasibly pursue deployment of a citywide ultra-high-speed fiber-based broadband network, either directly or through a public–private partnership. The CTC Report also aims to assist the City in distilling its goals and focusing on realistic solutions to meet the community's connectivity needs.

The CTC Report

Assumptions

The CTC Report recognizes that fiber-based connectivity designed to serve every business and resident in the community is an important foundation for taking full advantage of the power of broadband. A ubiquitous FTTP buildout ensures that, no matter who the retail service provider is, every resident and business has the opportunity to access the power of a fiber-based network infrastructure.

CTC believes that there is likely a significant gap in Madison with respect to very high-end competitive broadband services for small and medium-sized businesses. Larger business and institutions appear relatively well served by the incumbents and the competitive providers that are already present in the market—but as is the case in many markets, small and medium-sized businesses likely struggle to get affordable high-end services. Small businesses often buy residential services as an affordable, if not wholly sufficient, solution; if robust broadband is not available throughout the City for residents, there are likely even more gaps for small businesses.

There likely is a gap, too, when it comes to home-based businesses and teleworkers. Many teleworkers are sophisticated telecommunications users—and they need services that have greater reliability and capacity than the consumer-based broadband connections they have from the phone and cable companies that currently serve Madison.

Based on discussions with City staff regarding community goals, CTC recognizes the following objectives as the baseline for the City's broadband initiative:

- Equity – Alignment with Racial Equity and Social Justice (RESJ) and digital divide goals
- Ubiquity – Service is deployed to the entire City
- Competition in the marketplace – Enabling multiple providers to compete
- Consumer choice – Citizens can purchase service from various providers
- Control – The City has a long-term stake in the asset

CTC Project Tasks

1. Reviewed and inventoried the City's key physical infrastructure, including the Metropolitan Unified Fiber Network (MUFN);
2. Conducted interviews with representatives of City departments, stakeholders, and utility owners;
3. Researched the region's available broadband services and costs;
4. Conducted onsite and desk surveys of City infrastructure;
5. Evaluated potential public–private partnership business models based on current developments in the broadband industry; and
6. Developed pro forma financial statements for the City based on a dark fiber lease model, where the City would own and operate a fiber network, and grant access to it through dark fiber leasing.
7. Prepared a high-level network design and cost estimates for deploying a gigabit FTTP network.
8. Conducted a survey of Madison residents

Cost estimates and Financial Projections

The CTC Report's financial model is an important tool for the City to use to determine the financial impact of various case scenarios. This model will be critical for the City to use during negotiations with potential private partners, as it will allow the City to readily determine what it needs from private partners in order for the project to succeed.

These cost estimates provide data relevant to assessing the financial viability of network deployment, and offer guidance in developing business models for a potential City construction effort, including the full range of models for

public–private partnerships. These estimates also provide key inputs to financial modeling that determine the approximate revenue levels necessary for the City to service the debt incurred in building the network.

CTC developed a conceptual, high-level FTTP design that reflects the City's goals and is open to a variety of architecture options. From this design, CTC developed two sets of cost estimates:

1. The cost to deploy *only* the FTTP outside plant (OSP) infrastructure. This is the total capital cost for the City to build a dark FTTP network for lease to a private partner.

2. The cost to deploy FTTP OSP infrastructure, network electronics, service drops to the consumer, and customer premises equipment. This is an estimate of the total capital cost to build a citywide FTTP network without a private partner.

CTC provided two versions for each of these estimates: all-underground construction, and a combination of underground and aerial construction.

Table 1: Projected Cost Estimates Summary

	Dark FTTP (No Electronics Service Drops, or CPEs)	**Fiber, Network Electronics, Service Drops, and CPEs**
Aerial and Underground Construction	$143.5 million	$194 million
All Underground Construction	$149.1 million	$212 million

These capital cost estimates assume the use of MUFN to provide fiber optic connectivity between hub sites and distribution hub sites; space at existing City facilities to be used as core and distribution sites; and access to multiple Internet points of presence (POPs) for network connectivity. The use of MUFN as a backbone would significantly reduce the cost and complexity of deploying an FTTP network because the network already extends to all areas of the City. CTC's FTTP cost estimates assume that the use of MUFN may reduce the total cost of OSP construction by approximately 10 percent.

Operating cost estimates were also developed, with the complete financial model provided in Excel spreadsheet format so the City can later manipulate the variables to calculate the impact of changing the model's assumptions.

Ownership Models Considered

There are three basic types of municipal/private partnerships:

- **Private investment, public facilitation**: The model focuses not on a public sector investment, but on modest measures the public sector can take to enable or encourage greater private sector investment.
- **Private execution, public investment:** This model, which involves a substantial amount of public investment, is a variation on the traditional municipal ownership model for broadband infrastructure—but with private rather than public sector execution.
- **Shared investment and risk:** In this model, referred to as a "dark FTTP Partnership," localities and private partners share the capital, operating, and maintenance costs of a broadband network. In the "dark FTTP partnership," the City constructs and owns the fiber network, the private partner "lights" the fiber with electronics, and the private partner directly serves the end user. This is the model currently underway in the City of Westminster, MD and the City of Huntsville, AL.

Recommendations

Given the likelihood that the City-owned MUFN will be used as backbone fiber in the overall FTTP deployment, CTC recommends that the City pursue a model where it retains ownership of the fiber assets. Such a model will enable the City to make use of its existing fiber assets, and retain some degree of control over equity and ubiquity issues.

By publishing dark fiber lease rates and entering into a partnership arrangement that makes use of City-owned dark fiber at competitive rates, the City will not be competing with the private sector, but enabling it. The City will be reducing barriers to market entry for private providers so that they can offer innovative and new services to Madison residents and businesses.

CTC believes the model that best meets the City's objectives is a partnership in which the City owns and maintains the fiber, while one or more private entities light the network and offer services over it. There are a handful of local, regional and national private companies in the industry today that are willing to work with localities to deploy this model, and CTC encourages the City to open discussions with one or more of these vendors.

Next Steps:

1. CTC Report considered at next meeting of the Digital Technology Committee -Thursday, August 11, 2016 at 5 pm
2. City Council Public Hearing – September - November

Link to the full report w/appendices – Legistar File #38620 (madison.legistar.com)
https://madison.legistar.com/LegislationDetail.aspx?ID=2323974&GUID=5EEFEE71-A6E4-4233-A925-C6E742023B01