

Why Chattanooga is not the “Poster Child” for Municipal Broadband

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Last year, Federal Communications Commission Chairman Tom Wheeler authored a blog entitled *Removing Barriers to Community Broadband*.¹ In this blog, Mr. Wheeler held out the municipal system in Chattanooga, Tennessee, as the “poster child” for why “it is in the best interests of consumers and competition that the FCC exercises its power to preempt state laws that ban or restrict competition from community broadband.” In anticipation of the 2015 State of the Union Address, the Obama Administration jumped on Mr. Wheeler’s bandwagon both by issuing a formal report² and by having the President give a speech about helping municipalities build their own broadband networks to compete with privately-funded broadband providers.³ And on top of that, the White House provided political cover for Mr. Wheeler’s efforts by stating that it intends to file a letter with the Commission formally asking it to preempt state laws that prohibit and restrict municipal broadband.⁴

Putting aside the glaring legal infirmities of the Commission’s preemption authority over state laws that restrict or prohibit municipal broadband for the moment (including Section 706),⁵ the Chairman made three central claims to support his desire to promote municipal broadband:

First, that the Chattanooga experience can easily be replicated elsewhere.

Second, that Chattanooga’s municipal network resulted in “spurred” economic growth.

And third, that Chattanooga’s municipal network provides significant “competition” to existing cable and telephone network providers who, in Mr. Wheeler’s words, would rather “legislate than innovate.”

These claims are echoed by the White House.

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As I show in this PERSPECTIVE, however, while the White House’s and Mr. Wheeler’s proposals may make for good political theater, and even assuming Chattanooga’s fiber system is the most successful municipal broadband venture to date, the claim that Chattanooga is the reason why the FCC should use questionable legal authority to try to preempt state laws in order to allow local governments to build broadband networks glosses over several important details.⁶ While

Mr. Wheeler holds out Chattanooga as the “poster child” for community broadband—and the White House is playing along—once the facts are properly understood in context, generalizing the Chattanooga experience to the rest of the United States is a quite a stretch and is, as I see it, irresponsible.⁷ Chattanooga is unique in many respects, so care must be taken when generalizing this somewhat unique situation to other communities. Also, both Chairman Wheeler and the White House have shamefully evaded any recognition of many municipal broadband failures that have left taxpayers holding the bill, and these cases are every bit as important to good public policy as is the Chattanooga experience. In some cities a municipally-owned or municipally-supported system may be the only option for broadband, and a few cities may have the conscientious and skilled leadership necessary to make a go of it. Many will not. In any case, the widespread use of government money to build networks to compete with networks built with private sector money over many decades deserves an exceedingly careful analysis and not just grandstanding by the President and the Chairman.

The Chattanooga Experience Cannot Be Generalized

At the outset, it is important to recognize that the Chattanooga system was never a “greenfield” build. To the contrary, Chattanooga’s broadband system is constructed and maintained by the city’s municipal electric utility, the Chattanooga Electric Power Board (“EPB”). That’s right: Chattanoogaans also get their electricity from a government-run electric monopoly. In fact, the initial justification for Chattanooga’s fiber deployment was the cost savings it might generate for the electricity division.⁸ (These internal savings, as well as pure cost shifting, also make obtaining a clear picture as to the financial success of the broadband venture difficult to assess.)

The presence of spillover effects from its existing electric plant, and the ability to have the electric

division shoulder some of the costs of the broadband network, are significant and cannot be discounted in any honest evaluation of the Chattanooga experience.⁹ Spillovers between the electric and broadband segments reduce costs, thereby making profitable entry into broadband more likely (though success is not guaranteed).¹⁰ Where significant spillovers are absent, greenfield municipal networks—such as the infamous UTOPIA network—have failed miserably and cost taxpayers millions.¹¹ As discussed below, some municipal electrics also have failed miserably in their efforts to build broadband networks, passing on the losses to constituents and captive ratepayers.

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The help from Chattanooga’s electric division was not limited to spillover effects in the form of reduced costs to entry. In particular, the construction of the broadband network was paid for by \$229 million in revenue bonds and a \$50 million loan to the broadband division from the electric division.¹² It appears that the larger debt (\$229 million) is being serviced by captive ratepayers, not the broadband customers, for the purposes of Smart Grid technologies. (Note that Smart Grid applications do not require fiber optic connections, and home metering and real-time pricing can be accomplished using a 500

Kbps connection, well within the capacities of private-sector broadband networks.)¹³

Putting aside the financial support of broadband deployment by captive electric ratepayers for the moment, EPB's broadband system also received \$111 million grant from the U.S. Department of Energy—funds made available by the American Recovery and Reinvestment Act.¹⁴ Notably, this grant represents a gift from *all* Americans, not just Chattanoogaans, of about \$2,000 per subscriber (or about \$650 per electric customer in EPB's footprint).¹⁵ Such government subsidies stand in stark contrast to investment decisions by the private sector, as the nation's major broadband service providers do not receive such generous financial help from the federal government help to serve mostly urban markets (in fact, they receive nearly nothing to do so).

This sizable federal grant again makes generalization of the Chattanooga case problematic. First, for the most part, such federal funding for broadband deployment has dried up. Second, assuming other municipal systems required such help to get going, federal grants matching that in Chattanooga for the rest of nation would amount to about \$220 billion.¹⁶ By any measure, \$220 billion a lot of dough, especially when spent to overbuild existing broadband infrastructure. Including the full initial cost of the network's buildout (\$390 million), the money required for a nationwide municipal buildout is about \$780 billion (and that's for, on average, a third wireline broadband provider).¹⁷

What if the private-sector was the recipient of such largess? EPB's market includes about 170,000 units and it received a federal grant of \$111 million to serve them, or about \$650 per unit passed. Comcast, the nation's largest provider of broadband services, has about 54 million units passed.¹⁸ One has to wonder what could be accomplished if the government gave Comcast (not loaned it) the units-passed

equivalent of about \$35 billion in upfront capital to upgrade and expand its network; an amount about 11-times the annual investment of Comcast in its broadband infrastructure (about \$4 billion annually, excluding NBCUniversal investments). I suspect Comcast's network would be one of the most advanced in the world given that type of money. What would AT&T do if the government gave it (not loaned it) \$30 billion to support its planned expansion of U-Verse to an additional 30 million homes?¹⁹ Certainly, this gift would be a significant influx of investment cash that would greatly improve and expand AT&T's increasingly fiber-based network.

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I don't think these federally-funded cash injections are probable, but it is interesting to grasp the magnitude of the grant and the advantage given to the municipal system in Chattanooga relative to what is provided to the private sector. Given the size of the equivalent grants, it seems fairly clear that it is unreasonable to compare the deployment and upgrade schedules of the private sector against municipal systems that are the recipients of

massive federal cash infusions. As the Commission itself has recognized on numerous occasions, investors, unlike the federal government, don't give money away without any expectation of a return.²⁰

Finally, it is important to recognize that the scope efficiencies that could improve the financial case for broadband deployment by municipal electric systems are, obviously, limited to areas that have municipal electric systems. Today, only about 14% of customers are served by government-owned electric utilities, and these systems often serve rural markets where network deployment costs are very high.²¹ This essentially means that for the remaining 86% of Americans, municipal entry will have to take some form of a greenfield build. Thus, the Chattanooga experience again cannot be generalized to municipal broadband for the rest of the United States.²²

In fact, success isn't guaranteed even in markets where a municipal electric utility builds a broadband network. Consider the case of Groton, Connecticut. Groton Utilities is, like EPB, a municipal utility offering electricity services. The city decided to build a modern cable, telephone, and broadband network to compete with Comcast.²³ The city borrowed \$27.5 million to build the network. After incurring \$11 million in losses from the operation of the network, the broadband network was sold to a private investor for \$550,000 (the initial agreed upon selling price to the sole interested party was \$150,000). The \$38 million tally of debt and losses is being passed on to the city's captive electric ratepayers. One has to wonder why Chairman Wheeler traveled to Chattanooga for a photo-op instead of Groton?²⁴ Likewise, one must question why the *White House Report* failed to mention Groton even once? The answer seems obvious enough—the push for municipal broadband isn't thoughtful policy making, but is showmanship.

Economic Migration is Not the Same as Economic Growth

Is this government largess worth it? I doubt it. While Mr. Wheeler and the White House note the economic development attributed to the Chattanooga network, which may be considered a benefit, here's what Mr. Wheeler says: "Smaller businesses such as Claris Networks, Co.Lab, EDops, and Lamp Post Group relocated to the city, and Chattanooga is also emerging as an incubator for tech start-ups." "Relocated" is the operative word here, implying that the economic payoff from the Chattanooga network is derived from stealing businesses from other cities. Oddly, through the federal grant given to Chattanooga, it is the very people in these cities losing businesses that are funding the broadband network in Chattanooga that is destroying their economy. Also, such business stealing is not sustainable. As more and more cities get the fiber networks, there is less and less incentive to "relocate."

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Chattanooga may be wise to get a first-mover advantage in business stealing, but it's a "first-mover" advantage not available to municipal late-comers. I can see a city's leadership wanting advantage its city over others, but I'm not sure why a federal regulator should be so supportive of a particular project, since what helps one city hurts another. That's not to say

there isn't some overall economic gain from fiber deployment, but much of the benefit Mr. Wheeler and the White House attribute to municipal broadband deployment results from economic *migration* rather than from overall economic *growth*.²⁵ Stated another way, the benefits of fiber deployment by municipalities come largely from business stealing rather than absolute economic improvements.

Promoting Competition or Crowding Out?

The number of competitors in a market is an equilibrium outcome, not a policy choice.²⁶ Generally speaking, the number of competitors in a market is determined by the ratio of market size (in expenditures, adjusted for the intensity of price competition) to fixed entry costs.²⁷ Wireline broadband is a big market, but it also a hard business that requires massive capital investments. Among U.S. firms, AT&T and Verizon rank first and second for annual capital expenditures.²⁸

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Accordingly, if we view the equilibrium number of firms (N^*) as fixed, then the entry of a new firm, municipal or otherwise, must lead to the exit of another. The *National Broadband Plan* expressed some concern about the exit of broadband providers even absent municipal entry, so we should expect, other things constant and absent some radical technological innovation that significantly lowers entry costs, less private-sector provision of broadband services in response to municipal entry.²⁹ However, as the *National Broadband Plan* bluntly observed, "Municipal broadband has risks. Municipally financed service may discourage investment by private companies."³⁰ Successful municipal entry therefore cannot be viewed as

increasing competition, since there is a possibility of displacing private-sector investment.³¹ In the short run, we may see private sector firms invest more in an effort to protect their embedded investments to survive or win outright (consider the Groton experience discussed above), but in the end, firms will acknowledge that past investments are sunk. Eventually, the decision must be made as to whether or not to continue to invest in light of marketplace realities, including the realization or threat of a government's entry into your market using public funds.

For municipal broadband networks, the estimated breakeven penetration rates are often around 40-60%. If a 40% penetration is required to financially break even, then only two firms can survive. Thus, in most U.S. cities, a financially viable municipal broadband system means the loss of at least one private-sector provider.

An easy way to think about the crowding out issue is the concept of a breakeven market penetration rate. Communications networks are expensive to build and are thus subject to substantial economies of scale. As a result, financial success requires the acquisition of many customers. The breakeven penetration rate is the share of homes passed required for the network to earn a sufficient return to be viable. For municipal broadband networks, the estimated breakeven penetration rates are often around 40-60%.³² If a 40% penetration is required to financially break even, then only two firms can survive.³³ Thus, in most U.S. cities, a financially viable municipal broadband system means the loss of at least one private-sector provider.

Certainly, the threat of widespread municipal entry increases the risk of private investments; all entry does, but government entry imposes unique risks. In the long-run, the threat of municipal entry could curb privately-funded broadband expansion and upgrades, even rendering areas that would be profitable without such a threat too risky to enter with it.³⁴ As a consequence, the need for municipal financial support could rise with municipal entry—a potentially costly cycle.

Reducing Prices for Consumers?

Finally, we come to the empirics on competitive pricing. Last January, I authored a PERSPECTIVE challenging the New America Foundation's study that purported to show that municipal networks provide lower prices than their private sector counterparts.³⁵ Among the case studies provided was Chattanooga. When I corrected for New America's errors by comparing like services between the private sector and Chattanooga, it turns out that the Chattanooga prices were not lower than private sector offerings.

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For comparison, consider Comcast's services. For \$139.99, Comcast offers a 50 Mbps broadband service with about 170 channels of video and fully-featured, unlimited-calling voice

service. EPB's comparable triple-play, including a 100 Mbps broadband connection,³⁶ its largest programming tier of about 150 channels, and a fully-featured, unlimited-calling voice service, is priced at \$139.38. So, it appears that for comparable services, EPB and its private-sector rival are charging roughly equal prices.

While not serving the Chattanooga market, Verizon also offers across its FiOS footprint a 50 Mbps service as part of a triple-play. Verizon's bundle also includes about 215 video channels and a fully-featured, unlimited-calling voice service for the price of \$89.99. Verizon's price is much lower than is EPB's price, again leading to the rejection of the claim that municipal providers offer lower prices than do their private-sector counterparts, at least for comparable bundles of services.

Conclusion

Municipal broadband has its place, and admittedly the boundaries of that place can be blurry. Using government funds to supply broadband in unserved areas is sensible enough (subject to cost-benefit analysis), but to use government funds to add supply in a market already served deserves, at a minimum, close scrutiny. Notwithstanding, without any thought of a proper cost-benefit analysis, Chairman Wheeler and now the White House are vocal advocates of municipal broadband and in recent statements both labeled Chattanooga's fiber-optic deployment as an archetype for government entry into telecommunications.

Whatever one thinks about the Chattanooga system (and it is certainly an interesting case), it is not an archetype for widespread municipal fiber buildouts. First, the fiber deployment offers the electricity division cost efficiencies, and only about 14% of the nation is served by government-run power companies. Also, the Chattanooga system received \$111 million in federal support (about \$2,000 per subscriber). Extending the Chattanooga experience to the rest of the country would cost over \$220 billion

in grants, and the cost burden on municipalities would equal \$780 billion nationwide. There is no federal, state or city grant program available that could cover such expenditures.

Second, since a large share of economic benefits of such fiber networks come mostly from stealing businesses from other cities (cities whose population subsidize the Chattanooga system), it's unclear why a federal regulator should have a position on the topic; one city's gain is another's loss so there is little net gain at the federal level.

Third, the evidence does not suggest the municipal systems offer any price cuts to consumers relative to the privately-funded broadband providers. Since municipal systems are new construction, they are typically fiber and thus capable of far more bandwidth than presently needed. These high-capacity networks are intriguing, but good policy is not made by focusing on shiny things; good policy is made by reasoned analysis – at least, that's the goal.

Finally, given the economics of supplying wireline broadband service, a successful municipal venture is unlikely to lead to a long-term increase in the number of providers; more likely, the exit of private-sector providers will probably ensue in the long-run.

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¹ T. Wheeler, *Removing Barriers to Competitive Community Broadband*, OFFICIAL FCC BLOG (June 10, 2014) (available at: <http://www.fcc.gov/blog/removing-barriers-competitive-community-broadband>).

² *Community-Based Broadband Solutions: The Benefits of Competition and Choice for Community Development and Highspeed Internet Access*, Executive Office of the President (January 2015) (available at: http://www.whitehouse.gov/sites/default/files/docs/community-based_broadband_report_by_executive_office_of_the_president.pdf) (hereinafter “White House Report”).

³ Remarks by the President on Promoting Community Broadband, Cedar Falls Utilities, Cedar Falls, Iowa (January 14, 2015) (<http://www.whitehouse.gov/the-press-office/2015/01/14/remarks-president-promoting-community-broadband>).

⁴ FACT SHEET: *Broadband That Works: Promoting Competition & Local Choice In Next-Generation Connectivity*, The White House (January 13, 2015) (available at: <http://www.whitehouse.gov/the-press-office/2015/01/13/fact-sheet-broadband-works-promoting-competition-local-choice-next-gener>).

⁵ See L.J. Spiwak, *FCC Has No Authority to Preempt State Municipal Broadband Laws*, BLOOMBERG BNA (August 6, 2014) (available at: <http://www.phoenix-center.org/BloombergBNAMuniBroadband.pdf>); see also M. Berry, Remarks of Matthew Berry, Chief Of Staff to FCC Commissioner Ajit Pai, at the National Conference of State Legislatures’ 2014 Legislative Summit Minneapolis, Minnesota (August 20, 2014) (available at: https://apps.fcc.gov/edocs_public/attachmatch/DOC-328916A1.pdf).

⁶ The White House reports also mentions two other municipal electric broadband systems in Wilson, NC, and Lafayette, LA. See *White House Report*, *supra* n. 2.

⁷ A similar point is made by Harold DePriest, head of Chattanooga’s municipal broadband system, at a hearing before the Tennessee State Legislature (“This stuff is not cheap, it is not easy, and [] I’m not really telling you that every community is going to run out and build broadband, that doesn’t make sense to me (at 8:32)”) (available at: <https://www.youtube.com/watch?v=oRtzmNMGILo&index=19&list=FLeDkoYbc2YqmOTN6BcfU0IQ>). The entire video is worth watching as Mr. DePriest makes a respectable case for municipal broadband.

⁸ See Electric Power Board of Chattanooga, Tennessee Petition for Preemption of a Portion of Section 7-52-601 of the Tennessee Code Annotated Pursuant to Section 706 of the Telecommunications Act of 1996 for Removal of State Barriers to Broadband Investment and Competition at pp. 23-24 (available at: <https://www.epb.net/downloads/legal/EPB-FCCPetition.pdf>).

⁹ For example, such spillovers explain, in large part, cable’s entry into the telephone market. See, e.g., G.S. Ford, T.M. Koutsky and L.J. Spiwak, *Competition After Unbundling: Entry, Industry Structure and Convergence*, 59 FEDERAL COMMUNICATIONS LAW JOURNAL 331 (2007).

¹⁰ See, e.g., L.J. Spiwak, *Utility Entry Into Telecommunications: Exactly How Serious Are We?* PHOENIX CENTER POLICY PAPER No. 1 (July 1998) (available at: <http://www.phoenix-center.org/pcpp/PCPP1Final.pdf>).

¹¹ T.A. Schatz and R. Van Tassell, *Municipal Broadband Is No Utopia*, WALL STREET JOURNAL (June 19, 2014) (available at: <http://online.wsj.com/articles/municipal-broadband-is-no-utopia-1403220660>).

¹² See, e.g., C. Davidson and M. Santorelli, *Understanding the Debate over Government-Owned Broadband Networks: Context, Lessons Learned, and a Way Forward for Policy Makers – Chattanooga Case Study*, New York Law School (June 2014) (available at: <http://www.nyls.edu/advanced-communications-law-and-policy-institute/wp-content/uploads/sites/169/2013/08/ACLP-%E2%80%93-Chattanooga-Case-Study-%E2%80%93-June-2014.pdf>); C. Mitchell, *Broadband at the Speed of Light: How Three Communities Built Next-Generation Networks*, Benton Foundation (April 2012) (available at: <http://www.ilsr.org/wp-content/uploads/2012/04/muni-bb-speed-light.pdf>).

¹³ P. Fuhr, W. Manges, T. Kuruganti, *Smart Grid Communications Bandwidth Requirements: An Overview*, SG COMMUNICATIONS TECHNOLOGY REVIEW (February 2011) (available at: <http://trustworthywireless.ornl.gov/pdfs/Smart-Grid-Communications-Overview-Bandwidth-2011.pdf>).

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- ¹⁴ K.E. McCarthy, *Chattanooga High Speed Broadband Initiative*, OLR RESEARCH REPORT 2012-R-0515 (December 14, 2012) (available at: <http://www.cga.ct.gov/2012/rpt/2012-R-0515.htm>).
- ¹⁵ EPB Financial Statement (2013) (available at: https://www.epb.net/flash/annual-reports/2013/downloads/EPB_Financials_2013.pdf).
- ¹⁶ Scaling requires a few calculations. First, I must scale to the population. EPB passes about 100,000 households. In 2013, there were 123 million U.S. households. Second, Chattanooga is also a relatively urban area, so deployment costs are cheaper in that city than the national average. Using the FCC's Hybrid Proxy Cost Model, average national loop costs are about 1.7 times larger than loop costs in Chattanooga (available at: <http://transition.fcc.gov/wcb/tapd/hcpm/welcome.html>). The total scaling ratio is about 2,000:1.
- ¹⁷ *In the Matter of Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act*, FCC 12-90, 27 FCC Rcd 10342 EIGHTH BROADBAND PROGRESS REPORT (rel. August 21, 2012) at Chart 1 (available at: <http://www.fcc.gov/reports/eighth-broadband-progress-report>).
- ¹⁸ Comcast Form 10-K (2013) (available at: <http://www.cmcsa.com/annuals.cfm>).
- ¹⁹ AT&T Form 10-K (2013) (available at: <http://phx.corporate-ir.net/phoenix.zhtml?c=113088&p=irol-SECText&TEXT=aHR0cDovL2FwaS50ZW5rd2l6YXJkLmNvbS9maWxpbnmcueG1sP2lwYWdlPTk0MTM4NDQmRFNFUT0wJINRREVTQz1TRUNUSU9OX0VOVEISRSZzdWJzaWQ9NTc%3d>).
- ²⁰ See, e.g., CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN, Federal Communications Commission (March 16, 2010) (available at: http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-296935A1.pdf) (hereinafter the *National Broadband Plan*) at p. 136 (When "service providers in these areas cannot earn enough revenue to cover the costs of deploying and operating broadband networks, including expected returns on capital, there is no business case to offer broadband services..."); *The Broadband Availability Gap*, FCC OMNIBUS BROADBAND INITIATIVE (OBI) TECHNICAL PAPER NO. 1 (2010) at p. 1 ("[p]rivate capital will only be available to fund investments in broadband networks where it is possible to earn returns in excess of the cost of capital. In short, only profitable networks will attract the investment required.") (available at <http://download.broadband.gov/plan/the-broadband-availability-gap-obi-technical-paper-no-1.pdf>); but see Wheeler, *supra* n. 1 ("The [Chattanooga] network was partly built out of necessity. Local phone and cable companies chose to delay improvements in broadband service to the Chattanooga area market.")
- ²¹ <http://www.publicpower.org/files/PDFs/USElectricUtilityIndustryStatistics.pdf>
- ²² It is interesting to note that while there are a number of cases where municipal-electric systems have deployed fiber, we don't see investor-owned utilities making such investments. To blame, in part, are regulations on private sector power companies, which are different and more onerous than those faced by municipal systems, discourage such investments. Here is one advantage that the public sector has that private sector firms do not. For example, private sector power companies are generally not permitted to allow broadband network costs influence power bills, though municipal systems often face no such limitation. It was noted during the debates over Chattanooga's system that if the broadband network was a total failure that the average electric ratepayer would face a cost increase of \$2 to \$3 per month. See *Broadband at the Speed of Light*, *supra* n. 12, at p. 35. This figure was intended, I believe, to argue that the venture was low risk, but any Investor Owned Utility ("IOU") offering a similar rate increase for a prospective business failure would be laughed (or booted) out of its state regulator's office. While Chairman Wheeler talks big about eliminating rules limiting municipal entry, he has failed to even mention state regulations that discourage investor-owned utility investments in broadband. Investor-owned utilities, like municipal utilities, have spillover opportunities into the broadband marketplace. Perhaps this omission says something about Chairman Wheeler's preference for government, rather than private-sector, provision of broadband services. Perhaps not.
- ²³ G. Smith, *Groton's Deal to Shed TVC Finalized as New Owners Take the Reins*, THE DAY.COM CONNECTICUT (February 1, 2013) (available at: <http://www.theday.com/article/20130201/NWS01/130209982/-/zip06&town=Norwich&template=zip06art>); D. Straszheim, *How a Promising Idea Went Terribly Wrong in Groton*, GROTON PATCH (January 6, 2013) (available at: <http://groton.patch.com/groups/politics-and-elections/p/how-a-promising-idea-went-horribly-wrong-in-groton>); Groton Utilities (available at: <http://www.grotonutilities.com>).

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²⁴ See Wheeler Blog, *supra* n. 1.

²⁵ *White House Report*, *supra* n. 2 at p. 14 (“helped the City attract a new community of computer engineers, tech entrepreneurs and investors (emphasis added)”).

²⁶ G.S. Ford, T.M. Koutsky, and L.J. Spiwak, *Competition After Unbundling: Entry, Industry Structure and Convergence*, 59 FEDERAL COMMUNICATIONS LAW JOURNAL 331 (2007)(available at: <http://phoenix-center.org/papers/FCLJCompetitionAfterUnbundling.pdf>).

²⁷ *Id.*

²⁸ D. Carew and M. Mandel, *U.S. Investment Heroes of 2013: The Companies Betting on America’s Future*, Progressive Policy Institute (September 2013) (available at: <http://www.progressivepolicy.org/issues/economy/investment-heroes-who%E2%80%99s-betting-on-america%E2%80%99s-future>).

²⁹ *Supra* n. 20.

³⁰ *Id.* at p. 153.

³¹ In a paper published in 2007 (using 2004 data), I presented evidence that municipal investments in communications networks did not crowd out, but rather stimulated, entry by CLECs. Given changes in FCC policy, CLECs are now largely a bygone. G.S. Ford, *Does a Municipal Electric’s Supply of Communications Crowd Out Private Communications Investment? An Empirical Study*, 29 ENERGY ECONOMICS 467-478 (2007).

³² See, e.g., *Martinsville, Virginia: Fiber to the Premise Feasibility Study*, CCG Consulting, LLC (November 30, 2012) (available at: http://www.martinsville-va.gov/content/File/fiber_optic_report_feasibility_study_nov_2012.pdf) (breakeven penetration rate 42% to 62%); *Municipal Fiber to the Home Deployments: Next Generation Broadband as a Municipal Utility*, FTTH Council (October 2009) (available at: www.ftthcouncil.org/d/do/69); *Austin, Minnesota: Ultra-broadband Feasibility Study*, CCG Consulting, LLC (March 27, 2014) at p. 66 (40% to 46% breakeven penetration) (available at: http://gigaustin.org/uploads/Ultra-broadband_Feasibility_Austin_3-27-14_1.pdf).

³³ A 40% penetration is of all homes passed, and only about 80% of total homes passed subscribe to any broadband service. See, e.g., A. Banerjee and M. Sirbu, *Towards Technologically and Competitively Neutral Fiber to the Home (FTTH) Infrastructure*, Working Paper (2003) at p. 23 (“if a 35-40% penetration is required for profitability, then in the long run at most two firms can profitably serve the same market”) (available at: http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2060612).

³⁴ While opposition to municipal entry by larger providers is frequently discussed and disliked, smaller competitors in the Chattanooga area are also not happy competing with the government, and have noted to difficulty of obtaining financing under such conditions. See A. Rued, *Chattanooga Broadband: High Speeds at an Even Higher Price*, AMERICAN LEGISLATOR (April 15, 2013) (available at: <http://www.americanlegislator.org/chattanooga-broadband-high-speeds-at-an-even-higher-price>).

³⁵ G.S. Ford, PHOENIX CENTER POLICY PERSPECTIVE NO. 14-01: *Do Municipal Networks Offer More Attractive Service Offerings than Private Sector Providers? A Review and Expansion of the Evidence* (January 27, 2014) (available at: <http://www.phoenix-center.org/perspectives/Perspective14-01Final.pdf>).

³⁶ EPB’s lowest speed offering is 100 Mbps, but I doubt most consumers could tell the difference between 50 and 100 Mbps.