Testimony of

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on behalf of

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before the

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Subcommittee on Telecommunications and the Internet of the
Committee on Energy and Commerce

Regarding

A Legislative Hearing on H.R. _____, a Discussion Draft Addressing Broadband Mapping and Data Collection

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SUMMARY

Free Press, Consumers Union, and Consumer Federation of America appreciate the opportunity to testify on the discussion draft of a bill to improve the quality of broadband data collection. As consumer advocates, we strongly support policies that will bring more broadband competition to American households. Building a solid base of knowledge on which to make competition policy is an important step that should enjoy broad support. The current broadband problems we face are severe and the consequences of resting on the status quo unacceptable.

We recommend this Committee move forward with the bill under consideration, with some modifications, in order to swiftly improve the available data on U.S. broadband performance. We must have this information in order to understand, confront and remedy the problems in the current broadband market. The Federal Communications Commission's (FCC) efforts up to this point to provide Congress with adequate data on broadband deployment have been completely unsatisfactory. Change is imperative.

With current data -- inadequate though it may be -- we can see that the U.S. broadband market has significant failures in the three metrics that matter most: availability, speed and value (cost per unit of speed). Despite years of rhetoric promoting universal availability, roughly 10 percent of American households still lack a terrestrial broadband provider. We pay more for a lot less bandwidth than our global competitors. We do not have a competitive market that is pushing speeds up and prices down at a rate sufficient to raise our stature relative to the rest of the world. In a study released last month by the Organisation for Economic Co-operation and Development (OECD), the U.S. has dropped from 12th to 15th among the 30 member nations in the last six months. Our growth rate relative to the OECD nations between the 2005 and 2006 ranks us 20th.

To determine which policies may best solve these problems, we need better information about what is going on in our neighborhoods, towns and cities. Current data shows us the big picture problems; but it is insufficient to reveal the situation at the local level and guide solutions. With the collection of better broadband market data gathered under the terms of this bill, we can:

- Evaluate the true state of broadband availability and adoption -- by technology, speed and price -- at the local level;
- Evaluate not only the absence of broadband or a low penetration rate, but also understand the reasons why, and the policies most likely to remedy the problems;
- Target direct investment in broadband where it is most needed;
- Enhance competition where it is failing to discipline prices and improve quality;
- Create programs to bring equipment and technology training to local communities;
- Assess and reverse the long-term trends which show us falling behind the rest of the world.

We recommend that the Committee implement all of the tools proposed in this draft bill. We also suggest a variety of additional measures including: establishing an evolving standard for "high-speed" Internet access; establishing a true measure of broadband deployment and adoption to replace the FCC's inadequate system; expanding our inquiry into infrastructure costs and Internet traffic. For consumers, the situation is clear. If we can speed the implementation of new technologies, faster speeds and lower prices by gathering the data needed for good public policy, we should move forward with all deliberate speed. We look forward to working with the Committee on this important legislation.

Assessing U.S. Broadband Markets

For years, the Congress has grappled with the policy challenges of bringing universal, affordable access to high-speed Internet services and increasing U.S. household broadband penetration rates. The results have been unambiguous and unflattering. A significant number of American households -- around 10 percent -- have no available terrestrial broadband service.[1] A much larger percentage -- over 40 percent -- have service available to them, but they do not subscribe, foregoing the social and economic benefits of connectivity because of high prices, a lack of equipment and training, or simple disinterest.[2] Rural areas lag behind urban areas in broadband access. The poorest among us are the least likely to gain access to the technologies that could lead to social mobility. The cost to our economy and the quality of life in our society mounts each successive year that these problems go unsolved. Meanwhile, alarmingly, the U.S. is falling behind the rest of the world in broadband penetration and market performance, ceding the tremendous benefits of leading the world in network connectivity to others.

How do we begin to address the broadband problem? Our first task is to understand exactly what is happening in the marketplace. We need to know precisely where broadband is being offered and where it is not. We need to know how much competition is in each local market. We need a clear understanding of the prices and speeds available to American broadband consumers, no matter where they live. We need to know how many Americans are subscribing, how many are not; and if possible, we need to know why they do or do not subscribe. In short, we need data. Sadly, the Federal Communications Commission (FCC) has failed to provide good data for Congress to evaluate in making broadband policy.

The Discussion Draft before the Committee is therefore both timely and critical as a first step toward a national broadband policy that actually works for American consumers. The problems that it will solve have been well documented and urgently need attention. This testimony will provide a summary of the current problems with FCC's broadband data; an evaluation of the urgent problems in the broadband market; and specific commentary and recommendations on the Discussion Draft. Our central conclusion is that this bill should move forward, taking into consideration an evolving standard of "high-speed" access and incorporating a metric into the FCC's data-gathering methodology that is a true measure of deployment and penetration levels.

Broadband Data Problems

The FCC measures broadband deployment under the direction of the Telecommunications Act of 1996. But the information gathered on a ZIP code basis is flawed and incomplete.

- The FCC counts a ZIP code as covered by broadband service if it contains at least *one* broadband subscriber. Because ZIP codes are often large geographic areas, and service providers often cover only small fractions of that area, this measure is often highly inaccurate. We must have more granular data points to assess broadband deployment. The Government

[1] "Broadband Deployment is Extensive throughout the United States, but it is Difficult to Assess the Extent of Deployment Gaps in Rural Areas," Government Accountability Office, Report to Congressional Committees, GAO-06-426, May 2006.

[2] Extrapolated from "High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission.; calculated assuming one line per household, based on July 1 2006 Census household estimates; S. Derek Turner, "Broadband Reality Check II," Free Press, Consumers Union, and Consumer Federation of America, August 2006, Available at http://www.freepress.net/docs/bbrc2-final.pdf

Accountability Office (GAO) reviewed the FCC's methods and offered a thorough critique, showing glaring inaccuracies.[3] It is highly likely that many households in ZIP codes registered by the FCC as "covered" by broadband do not have a wireline broadband provider. Tellingly, the GAO notes that the FCC never intended the ZIP code method to be used as a measurement of broadband deployment. In fact, the FCC has never implemented a measurement system to accomplish that task.

- The FCC gives no consideration to the price, speed or availability of connections across the ZIP code. It is not enough simply to count the number of broadband providers that register at least one subscriber in a given ZIP code. We need to know where broadband is available in a ZIP code, what percentage of households are subscribing, and what price they are paying for what speeds. Without this information, we cannot precisely locate the gaps in broadband coverage, the disparities in price and service quality, and the remedies suggested by the patterns in the data.

- The standard the FCC uses to measure "high-speed" connections is misleading and low. The Telecommunications Act of 1996 mandates the FCC to ensure deployment of broadband "that enables users to originate and receive high-quality voice, data, graphics and video telecommunications." However, the standard used by the FCC to measure "high-speed" connections (200 kbps) is barely enough for users to *receive* low-quality streaming video. It is certainly insufficient for users to *originate* high-quality video.

- Because the FCC sets the standard for "high-speed" connections so low and fails to distinguish between business and residential service in counting coverage, the Commission dramatically overstates the number of providers offering service to a given household. The FCC counts satellite and mobile wireless broadband products in the same category with DSL and cable modems. These services are not in the same product market on either price or speed. GAO reports that FCC data shows that the median number of providers available to a household is 8. GAO puts that number at 2.[4] This is an unacceptable margin of error.

The FCC lacks the tools to even begin making good broadband policy. The GAO study from May of 2006 recommended that the FCC offer new ideas to this Committee for the collection of broadband data that would better reflect the actual level of deployment and penetration in the U.S. To our knowledge, this has not occurred. Despite repeated studies decrying the poor quality of FCC data collection[5], the FCC has just this month launched a Notice of Proposed Rulemaking (NPRM) into the matter.[6]

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[3] GAO, Op cit, "While FCC states that its zip-code information is not meant to be a measure of broadband deployment, some parties have used it in this manner because there are no other official data on deployment of broadband across the country."

[4] *Ibid.*

[5] S. Derek Turner, "Broadband Reality Check," Free Press, Consumers Union, and Consumer Federation of America, August 2005, Available at http://www.freepress.net/docs/broadband_report.pdf; S. Derek Turner, "Broadband Reality Check II," Free Press, Consumers Union, and Consumer Federation of America, August 2006, Available at http://www.freepress.net/docs/bbrc2-final.pdf; Communications Workers of America, "Speed Matters," October 3, 2006, Available at http://files.cwa-union.org/speedmatters/SpeedMattersCWAPositionPaper.pdf.

[6] Development of Nationwide Broadband Data to Evaluate Reasonable and Timely Deployment of Advanced Services to All Americans, Improvement of Wireless Broadband Subscribership Data, and Development of Data on Interconnected Voice over Internet Protocol (VoIP) Subscribership), Notice of Proposed Rule Making, WC Docket No. 07-38, April 16, 2007, Available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-07-17A1.pdf

Broadband Market in Crisis

The need for a change in broadband policy is facing a state of urgency. The President called for the U.S. to reach the universal broadband milestone by this year. There is now little chance we can achieve that result. While it is true that the total number of broadband lines deployed in the U.S. is rising and the total number of broadband users is now near 45 percent of the country, the U.S. growth rate in broadband penetration compared to other nations is not encouraging. Our growth rate between 2005 and 2006 earned us the 20th spot out of 30 OECD nations.[7] Countries like Belgium and South Korea -- whose markets had appeared to level off at a saturation point of broadband users -- have seen new surges in subscribership and gained more ground on the U.S.[8] Simply put, other nations are surpassing us. Though some have scrutinized the data from these studies to find some qualifications to ease our wounded pride, the trend lines are not in error. [See Appendix B for a discussion of issues surrounding the OECD data.]

The broadband problem is most commonly assessed through raw headcounts of households that have access to high-speed Internet service, what services are available, and how many consumers subscribe to those services. Though the data suffers from the problems noted above, the statistics we have are valuable insofar as they give us a general picture of competition in the marketplace and consumer behavior. According to the best available data:

- **Extrapolating from FCC data, nearly 60 percent of U.S. homes are not broadband adopters**.[9]
- **The rate of residential broadband adoption continues to slow**. From June 2005 to June 2006 the number of residential advance service lines increased 34 percent. But from June 2004 to June 2005 the increase was 62 percent.[10]
- **37 percent of ZIP codes have one or less cable and/or DSL provider**.[11] Given that FCC data overstates the level of broadband deployment; this should be viewed as a conservative figure.
- **Some states have large gaps in coverage.** Over 40 percent of South Dakota households are not wired for cable broadband. Over 40 percent of New Hampshire and Vermont households are not wired for DSL.[12] [See Appendix C for full statistics.]
- **The broadband market remains a duopoly**. 96 percent of residential advanced services lines are either cable or DSL.[13]
- **There are no viable 3rd "pipe" competitors.**

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[7] Organization for Economic Cooperation and Development (OECD), "OECD Broadband Statistics to December 2006," April 23, 2006, Available at http://www.oecd.org/sti/ict/broadband

[8] *Ibid.*

[9] "High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission.; calculated assuming one line per household, based on July 1 2006 Census household estimates.

[10] *Ibid.*

[11] *Ibid.*

[12] *Ibid.*

[13] *Ibid.*

- From June 2005 to June 2006 there were only 637 new broadband over powerline (BPL) connections added, bringing the total to just over 5000 nationwide, or 0.008 percent of all U.S. broadband connections.[14]
- From December 2005 to June 2006 the number of advanced service, satellite broadband connections DECREASED by 40 percent.[15]
- Mobile wireless broadband from cellular carriers enjoyed a rapid growth rate in the last year. However, these connections remain slow and costly compared to wireline alternatives. They are not substitutable competitors with DSL and cable modems, but rather form a complementary market dominated by vertically integrated firms with little incentive to cannibalize wireline market share. (See Appendix A for analysis).

This record of performance has not positioned us well in the race for global competitiveness -- with all of the economic and social benefits at stake. According to the OECD, the U.S. is 15th among the 30 member nations in broadband penetration, lagging behind the acknowledged world leaders -- the Netherlands and South Korea -- but also Canada and all of Scandinavia.[16] The International Telecommunications Union's (ITU), evaluating a larger number of countries than the OECD, places the U.S. at 16th.[17] A separate ITU study measuring a variety of factors in the Digital Opportunity Index, places the U.S. at 21st.[18] This is a particularly valuable analysis because it explores eleven different variables of technology development to assess each country in the study including the proportion of households with telephones, mobile telephones, computers and Internet access; the rates of connectivity to the communications infrastructure; and the cost of connectivity relative to per capita income.

It is critical to recognize that our evaluation of the broadband market's health must not end with a calculation of the available services, platform market share and subscribership. There are three key metrics for understanding the broadband problem: availability, speed and value (cost per unit of speed). In crafting a national broadband policy, we must recognize that true marketplace competition is the touchstone that yields marked improvements in all three metrics. Though the sizeable service gaps that leave rural America without a viable broadband connection are a huge problem, this is likely the easiest issue to resolve. Far more challenging are the starkly unfavorable comparisons in speed and value which separate us from the world leaders in broadband. The data-points below suggest that we have a long way to go to catch up with the rest of the world, even if we manage to reach the goal of universal availability.[19]

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[14] *Ibid.*
[15] *Ibid.*
[16] Organization for Economic Cooperation and Development (OECD), "OECD Broadband Statistics to December 2006," April 23, 2006, Available at http://www.oecd.org/sti/ict/broadband
[17] International Telecommunication Union, "Economies by broadband penetration, 2005," available at http://www.itu.int/ITU-D/ict/statistics/at_glance/top20_broad_2005.html
[18] International Telecommunications Union, "World Information Society Report 2006," available at, http://www.itu.int/osg/spu/publications/worldinformationsociety/2006/wisr-web.pdf
[19] For a detailed background on product availability in Europe, see: Ofcom, The International Communications Market 2006, http://www.ofcom.org.uk/research/cm/cm06/main.pdf

- According to Takashi Ebihara, senior director of the corporate strategy department at NTT East Corp, Americans pay 7 times as much on a cost-per-megabit basis for bandwidth compared to the Japanese -- $.70 versus $4.90. [20]
- A 50 megabit per second (mbps) connection in Japan costs $30 per month. Such speeds are not even available in the U.S. American customers can expect to pay $20 to $30 per month for (at best) 3 mbps of DSL connectivity or between $40 and $50 per month for 4 to 8 mbps of cable modem connectivity. Not only do American consumers settle for less, we often pay more for it. [21]
- A French company offers the "triple play" -- 50 mbps of symmetrical broadband service, unlimited telephony and cable television -- for 30 euros per month. Neither this level of service nor this price-point is available in the U.S. by a wide margin.[22]
- The proportion of slow connections is on the rise. In December 2005, 15 percent of broadband lines had upload speeds slower than 200 kbps. By June 2006 this had increased to 22 percent of lines. The proportion of DSL lines that had upload speeds slower than 200 kbps increased over the December 2006 to June 2006 time period from 18.4 percent and 18.9 percent.[23]
- Over half of all broadband connections in the U.S. are slower than 2.5 mbps.[24]
- Prices aren't dropping. Pew data[25] showed a year-to-year increase for cable, and a slight decrease for DSL -- but the bulk of that is due to low-intro slow-speed teaser rates. Yes, broadband speeds are slowly increasing, but we would expect a competitive broadband market to yield *both* quality increases and price cuts.

The consequences of lagging performance are severe. This isn't just a matter of pride at stake. This is real money. In 2003, when residential broadband penetration was at 20 percent, economists estimated the annual consumer surplus from broadband to be about $10 billion per year.[26] If broadband penetration were 50 percent of all U.S. homes, consumers would realize a $38 billion annual surplus. If household broadband penetration were at 95 percent, the consumer surplus would be $350 billion annually. Because of network effects, the *benefits of higher broadband penetration accumulate exponentially*, thus even a minor increase in our international broadband ranking has tremendous positive impact on the American economy. While we aren't capturing these dollars, someone else is.

All of these alarming facts point to the need for better information to reverse our course as quickly as possible. The critical first step must be to understand the problem as well as we can. To do that, we need to have good data. We do not have any national information about price or speed, and the statistics we have concerning availability and penetration are flawed. Rectifying this situation is the first order of business, and we are pleased to see this Discussion Draft on the table.

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[20] Grant Gross, "U.S. customers pay considerably more than the Japanese for bandwidth," IDG, 4 April 2007, http://www.infoworld.com/archives/emailPrint.jsp?R=printThis&A=/article/07/04/04/HNjapbroadband_1.html

[21] *Ibid.*

[22] "Neuf Offers 50 Mbps in Paris for 30 EUR per month," *MuniWireless*, 7 March 2007, http://www.muniwireless.com/article/articleview/5771/1/2/

[23] "High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission.

[24] *Ibid.*

[25] John B. Horrigan, "Home Broadband Adoption 2006," Pew Internet & American Life Project, May 28, 2006.

[26] Crandall et. al., "The Effect of Ubiquitous Broadband Adoption on Investment, Jobs, and the U.S. Economy," Criterion Economics, L.L.C., September 2003.

Analysis of the Discussion Draft

The Discussion Draft is an excellent point of departure for addressing our broadband data problems. This bill offers a variety of tools to begin analyzing our broadband markets by:

1. Revising upward the definition of "high-speed" Internet service to a more realistic level of 2 mbps download speed and 1 mbps upload speed.

2. Altering the FCC's reporting requirement for carriers to provide deployment data down to the ZIP+4 level to uncover micro-gaps in service availability.

3. Conducting an inquiry into the deployment, speed and price of broadband services internationally so that we have our own data sets to evaluate beyond OECD and ITU studies.

4. Producing a map through the NTIA showing which providers offer broadband service at the ZIP+4 level, using what type of technology -- and making that map available to the public.

5. Authorizing grants to state and local governments to conduct studies of broadband availability.

6. Initiating surveys at the FCC of broadband availability, price, actual speed and type of technology in different market areas -- and making that information available to the public.

The value of this information to analysts and researchers is hard to overstate. There is no doubt about its value to policymakers, industry analysts, marketers and consumers alike. It addresses several of the key data problems that have plagued us for years. With this bill, we will finally have information at the granular level about broadband availability, measured to a reasonable standard about what consumers consider to be "high-speed". We will finally have statistically generalizable data on price and actual speed. Consumers will be able to look at a map and identify which broadband providers offer service in their neighborhoods. Local and state governments will be empowered to work with community leaders, organizations and businesses to identify pent-up demand for broadband access, and provide families with the tools needed to make it worthwhile.

Concretely, what will this bill allow us to do that we could not do before? Let's take a real world example. Using FCC and Census data, we know that the state of Michigan currently ranks 35th among the 50 states in household broadband penetration with 36.8 percent of homes subscribing in 2006. We know that Michigan has improved from 15.2 percent penetration in 2002; and we know that this level of growth ranks the state 41st. We know that in June of 2006, 66.4 percent of ILEC telephone lines in the state were capable of providing DSL service. We know that 73.3 percent of these lines are owned by a RBOC, and we know that 25 percent of the population lives in a rural area. We know that in June of 2006, 91.7 percent of cable lines were capable of cable modem service in Michigan -- a *decrease* from the year before when that number was over 98 percent. [See Appendix C for a full state-by-state data set.] We can also see that the trend lines for broadband in Michigan show a decline in growth. [See Appendix D] Why is this happening? What accounts for Michigan's problems in performance and adoption? How do we interpret the data that we have? The fact is that we lack the relevant information to answer these questions appropriately.

We would all like to see Michigan -- and all of our other states -- perform better. Where do we start? We can see that there are problems to solve in Michigan, but we cannot see the best path

towards a solution. We do not have detailed information about what is happening in Michigan broadband markets beneath the aggregate state-level data. We do not know the price and speed of lines in different towns and cities. We do not know where the penetration rates are high and where they are low. We do not have the ability to compare different locations with similar characteristics in population or income. We do not know the number of lines available in a given area; nor do we have any strong evidence on which to base suppositions about why subscription rates are low or high. We cannot tell if broadband is expensive in a market with low adoption rates. We cannot tell where competition is insufficient to serve consumers. We cannot tell what accounts for the worrying developments in Michigan compared to the rest of the country. It is hard to pinpoint the correct method of policy intervention to help solve Michigan's broadband problems.

Should we pour money into a universal service program for rural broadband providers without any data on how to properly target it? Should we put in place a tax incentive for large carriers without knowing which areas have performed well and which haven't? Where should we target competition policy if we cannot tell where competition exists and where it does not? Can we really assess the health of a given broadband market in Michigan without knowing the price and speed of the average connection in different parts of the state? Is there information we could glean from local and state officials that would be useful?

With this bill we could begin to answer all of these questions and address the policy needs of Michigan. We could identify which areas -- down to the ZIP+4 level -- are falling behind. We could analyze each local market with low subscription rates and assess whether price, speed, competition or type of technology appear to play a role. We could map access across the state so that consumers are aware which types of service are available to them, and how many providers serve their communities. We could compare high performance towns with those that are struggling -- allowing us to identify divergent characteristics and address them. We could locate completely unserved areas and target direct investment. We could work with local governments to tailor social programs such as technology training and low-cost access to personal computers to bring families over the digital divide. We could compare the performance of different service providers across the state on price, speed and penetration rate. We could even begin to map demographic data onto our broadband markets to address the specific needs of our communities. Over time, using data and well-informed policy initiatives, we could develop best-practice models to bring us closer to our goal of universal, affordable broadband access and adoption.

This bill would represent a leap forward in our knowledge about broadband markets and the adeptness with which we can make broadband policy. For these reasons, we strongly support the creation of all the tools proposed in the draft and endorse the spirit of the bill. However, we do see some room for improvement. We offer below a number of recommendations for consideration as this bill moves toward its final form.

Recommendations for the Discussion Draft

We strongly support the revision of the FCC's definition of "high-speed" service upward from 200 kbps. It is appropriate to categorize different types of lines by the speeds of upload and download, but the Commission should continue to capture information about all lines that are faster than dial-up speeds. This will ensure continuity in the data set so that we can measure different kinds of broadband products over time.

We recommend that the Committee consider language requiring the FCC to review the definition of "high-speed" on an ongoing basis so that it is an evolving standard that matches the state of the market. If we aspire to regain our perch atop the world's leading broadband nations, we must continuously set the bar higher. We also suggest that in the future, the definition of "high-speed" service be adjusted to require symmetrical download and upload speeds. The promise of broadband lies in its ability to facilitate two-way communications, not just one-way broadcasting.

We recommend that the Committee consider carefully whether or not the FCC is addressing the directive from Congress in Section 706 of the Telecommunications Act. Section 706(b) states that the FCC should "determine whether advanced telecommunications capability is being deployed to all Americans in a reasonable and timely fashion." This language is fulfilled by the FCC's periodical section 706 reports, which are based primarily on the semi-annual Form 477 reporting. Form 477 gathers info on the total number of high-speed and advanced service lines -- tabulated by technology, by customer type (residential or business), and by state. Form 477 also reports the number of providers in a given ZIP code that declare at least a single customer. Thus the current FCC ZIP code data is *not* a metric of deployment. Indeed, the FCC conceded this point in the original 477 Order. The ZIP code methodology was not meant to be a metric of deployment. Currently, there is no other direct metric for the FCC to use to assess deployment at any level of granularity. We simply do not know how many broadband capable lines have been deployed beneath the state-level data.

The Discussion Draft expands the metrics for the inquiry directed by 706(b), but it does not specifically remedy the FCC's failure to produce an actual metric of deployment. The move from ZIP code to ZIP+4 is an important innovation, which will allow the FCC to uncover micro-gaps in broadband availability that were invisible before. However, this will not tell us how many lines in each ZIP+4 are broadband capable; nor will it measure ZIP+4 areas where broadband has been deployed but there are no subscribers. It also fails to give us a direct metric of subscribership (penetration), because the number of subscribers in a given ZIP or ZIP+4 area will remain unknown.

We recommend that the Committee consider amending its changes to Form 477 to include not only the ZIP+4 data (i.e. the number of providers with at least one subscriber in a ZIP+4), but also the number of lines that are broadband capable in that ZIP+4 and the number of households that have subscribed. This information would revolutionize our understanding of local broadband markets and permit highly focused policies to bring investment, competition and social programs to increase broadband adoption.

We recommend that the Committee also initiate studies of cost and feasibility of broadband technologies. For many years, it has been the stated goal of the U.S. government to make broadband connections universal. Yet we do not have reliable cost estimates for realizing that goal,

much less have we compared the costs of deploying different technologies to accomplish the task. For years, we have heard that technologies like broadband over power lines and satellite wireless broadband were inches from transforming the marketplace. Yet we did not study these issues sufficiently to determine that those estimates were overblown and unrealistic. A paucity of information has led us to false expectations and delay, distracting from the need to seek out the necessary data-points to make policy. Beyond this problem, we do not have any reliable estimates as to the cost of equipping wire centers with the electronics capable of higher speed DSL. We do not have cost estimates of pushing fiber-optic lines further out in the network -- nor a study of the current and projected demand for broadband capacity in the nation. All of these big picture analyses would be highly useful.

Beyond the collection of market data, we should look to empower the research community (both government- and university-led) to study the Internet. It is hard to believe, but not a single data-link on the privately-owned Internet backbone today is available for study by researchers. Our understanding of the flow of traffic over the network is very limited as a result. Using the proper safeguards to guarantee privacy and protect proprietary commercial information, we should empower the research community to study the problems of the Internet that inhibit our progress. These include security issues, spam, routing tables, peering, packet loss, latency, jitter and a wide variety of topics that could benefit from the application of scientific scrutiny. We should put the country's greatest minds to work on these problems to assist our network owners. This collaborative model of research and production has always been the basis of technological leaps in the Internet space. At present, the only government programs looking into these matters are not driven by competition policy, but rather by national security. The Department of Homeland Security's PREDICT program offers a useful model for this Committee to explore.[27]

Conclusion

The status quo is unacceptable. If we watch and wait, trusting that today's artificially constrained marketplace will magically solve the broadband problem, we will see the U.S. slip farther behind the rest of the world and widen the digital divide -- both domestically and internationally. The consequences are too severe to tolerate this narrow path.

The current trend-lines are clear. We continue to have large gaps in broadband service across the nation. Worse still, the networks we do have are slower, more expensive and less competitive than the global leaders in broadband performance.

The first step on the road to broadband recovery is understanding the problem. We must rectify the deplorable state of data collection in the broadband market. What we do not know undercuts our ability to craft and target viable solutions. Unfortunately, we have just enough data to see the outlines of our problems, but we lack the specific information that would allow us to target and implement solutions at the local level. It is to this task that the Committee must turn its attention. We applaud the spirit behind this Discussion Draft and support the provisions it would introduce.

Solving the broadband problem is a serious challenge of profound importance. We look forward to working with the Committee to find productive solutions.

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[27] See: https://www.predict.org/

Appendix A – Sample Mobile Broadband Offers

Mobile broadband service programs are expensive, slow, not universally available, and severely restrictive. These new mobile broadband lines are for the most part mobile devices with a data service capable of accessing the Internet at under 200 kbps speeds. They are highly unlikely to be used as a primary home broadband connection. In fact, 89.5 percent of mobile wireless connections are business subscribers, not residential subscribers.[28] In total, 17 percent of all broadband lines counted by the FCC are now mobile wireless. But only 3.8 percent of advanced service lines are mobile wireless (under 200 kbps in both directions), and only 2.5 percent of residential advanced service lines are mobile wireless.[29] What's more, the three largest mobile data carriers are AT&T, Verizon and Sprint. Two of these three carriers are also ILECs; are the number one (AT&T) and number three (Verizon) most subscribed-to broadband Internet service providers; and are the top two DSL providers in the U.S.[30] Sprint's joint venture with cable operators also diminishes any potential role it could play as a third pipe.[31]

Here is a sample of available offers:[32]

Sprint

- In Rev A coverage areas (available to 100 million people)
    - Download Speed: 600-1400 kbps
    - Upload Speed: 350-500 kbps
    - Price: $59.99 per month with a 2-year contract. *Or* $79.99 per month with a one-year contract.
        - $36 activation fee
        - $200 early termination fee.
        - Numerous taxes, surcharges and fees
- In non-Rev A coverage areas (available to 94 million additional people)
    - Download Speed: 400-700 kbps
    - Upload Speed: 50-70 kbps
    - Price: Same as above
- Service restrictions:
- "Use as a private line or frame relay service substitution, service, or like equivalent, is prohibited. Not available while roaming. Premium content not available. Shared data not available."
- "We reserve the right to limit or suspend any heavy, continuous data usage that adversely impacts our network performance or hinders access to our network. If your Services include unlimited web or data access, you also can't use your Device as a modem for computers or

[28] "High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission.
[29] *Ibid.*
[30] Leichtman Research Group, May 2006.
[31] See: http://www2.sprint.com/mr/news_dtl.do?id=8961
[32] Published offerings of Sprint, Verizon and AT&T as of April 19th 2007.

other equipment, unless we identify the Service or Device you have selected as specifically intended for that purpose."

Verizon

- In Rev A coverage areas (available to 135 million people)
    - Download Speed: 600-1400 kbps
    - Upload Speed: 350-500 kbps
    - Price: $59.99 per month with a 2-year contract, *and* customer must also be a Verizon voice customer. *Or* $79.99 per month with a one-year contract.
        - $25-$35 activation fee
        - $175 early termination fee.
        - Numerous taxes, surcharges and fees
- In non-Rev A coverage areas (available to 67 million additional people)
    - Download Speed: 400-700 kbps
    - Upload Speed: 50-70 kbps
    - Price: Same as above
- Service restrictions:
- "Examples of prohibited uses include, without limitation, the following: (i) continuous uploading, downloading, or streaming of audio or video programming or games; (ii) server devices or host computer applications, including, but not limited to, Web camera posts or broadcasts, automatic data feeds, automated machine to-machine connections or peer-to-peer (P2P) file-sharing; or (iii) as a substitute or backup for private lines or dedicated data connections.
- Will terminate service if you exceed 5GB per month -- or about 6 CD's worth of data (800MB each).

AT&T

- Download Speed: 400-700 kbps
- Upload Speed: 50-70 kbps
- Price: $59.99 per month with a 2-year contract *and* subscription to a voice plan that's at least $39.99 per month. *Or* $79.99 per month with a 1-year contract.
    - $36 activation fee
    - $175 early termination fee.
    - Numerous taxes, surcharges and fees
- Service restrictions:
    - "PROHIBITED USES INCLUDE, BUT ARE NOT LIMITED TO, USING SERVICES: (I) WITH SERVER DEVICES OR WITH HOST COMPUTER APPLICATIONS, INCLUDING, WITHOUT LIMITATION, WEB CAMERA POSTS OR BROADCASTS, CONTINUOUS JPEG FILE TRANSFERS,

AUTOMATIC DATA FEEDS, TELEMETRY APPLICATIONS, PEER-TO-PEER (P2P) FILE SHARING, AUTOMATED FUNCTIONS OR ANY OTHER MACHINE-TO-MACHINE APPLICATIONS; (II) AS SUBSTITUTE OR BACKUP FOR PRIVATE LINES OR DEDICATED DATA CONNECTIONS; (III) FOR VOICE OVER IP"

- **"UNLIMITED PLANS CANNOT BE USED FOR UPLOADING, DOWNLOADING OR STREAMING OF VIDEO CONTENT (E.G. MOVIES, TV), MUSIC OR GAMES**."
- "Service is not intended to provide full-time connections, and the Service may be discontinued after a significant period of inactivity or after sessions of excessive usage. Cingular reserves the right to (i) limit throughput or amount of data transferred, deny Service and/or terminate Service, without notice"

Appendix B – Addressing the Significance of International Technology Rankings

The latest broadband data from the Organisation for Economic Co-operation and Development (OECD) shows that the United States ranks 15th out of the 30 member nations in per-capita broadband use, down from 12th place just six months ago, and down from 4th place in 2001. In terms of growth in broadband penetration over the past year, the U.S. ranks 20th out of 30. The ITU's 2005 broadband penetration data had the U.S. at 16th overall in the world, a figure that will likely show a drop to 20th when updated data is released. ITU includes several countries in its study with high broadband performance that are not OECD members (which is why the numbers vary).[33]

The U.S. ranks 21st in another ITU metric -- the Digital Opportunity Index -- which measures eleven different variables of technology development, including an important factor not captured in the simple broadband rankings -- the cost of connectivity relative to per capita income. Notably, the U.S. dropped from 8th place in the Digital Opportunity Index in 2000 to 21st place by 2005. We are ranked 36th relative to other nations in the increase in the absolute value of our Digital Opportunity Index score between 2000 and 2005.[34]

We have seen numerous arguments from incumbents eager to discredit these international rankings. They offer ways to explain away the declining status of the U.S. as a global technology pioneer and leader. Given the volume of evidence showing problems in the broadband market, those who would claim otherwise bear a heavy burden of proof. We analyzed the available data and evaluated some of the key arguments supporting and opposing the international rankings. We found that these rankings do have significant meaning.

International rankings matter. Here's why:

- Currently about 45 percent of U.S. households subscribe to broadband service. If the U.S.'s penetration level were as high as in Denmark or the Netherlands, this would translate into an additional 36 million total subscribers, or approximately 33 million additional residential subscribers. This would put the U.S. household penetration level at 67 percent. If the U.S.'s penetration level were as high as 9th-ranked Canada, this would translate into an additional 12.5 million total subscribers, or about 11.5 million additional residential subscribers. This would put the U.S. household penetration level at 50 percent.[35]
    - **These differences have real world consequences.** In 2003 when residential broadband penetration was at 20 percent, economists estimated the annual consumer surplus from broadband to be about $10 billion per year.[36] If broadband penetration were 50 percent of all U.S. homes, consumers would realize a $38 billion annual surplus. If household broadband penetration were at 95 percent, the consumer surplus would be $350 billion annually. Because of network effects, the *benefits of higher broadband penetration accumulate exponentially*, thus **even a minor increase in our international broadband ranking has tremendous positive impact on the American economy.**

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[33] In the 2005 ITU rankings (available at http://www.itu.int/ITU-D/ict/statistics/at_glance/top20_broad_2005.html) four nations were ahead of the U.S. that are not included in the OECD rankings -- Liechtenstein, Hong Kong, Taiwan, and Israel.

[34] International Telecommunications Union, "World Information Society Report 2006", available at http://www.itu.int/osg/spu/publications/worldinformationsociety/2006/report.html.

[35] These data are extrapolated from official FCC broadband data reported in "High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission; calculated assuming one line per household, based on July 2006 Census household estimates.

[36] Crandall et. al., "The Effect of Ubiquitous Broadband Adoption on Investment, Jobs, and the U.S. Economy," Criterion Economics, L.L.C., September 2003.

- Though our position in the international rankings is cause for concern, even more troubling is how we have progressed in recent years relative to other countries. From December 2001 to December 2006 the U.S. penetration in the OECD rankings increased by 15.1 subscribers per 100 inhabitants, below the OECD average of 15.9, and 14th overall in the amount of increase among the 30 nations. The average five-year growth rate of the countries that outperformed the U.S. since 2001 is 40 percent higher, and the growth rate of the top performing country, The Netherlands, is over 85 percent higher than that of the U.S.[37]
- From December 2005 to December 2006, the U.S. penetration in the OECD rankings increased by 3.3 subscribers per 100 inhabitants, below the OECD average of 3.4, and 20th overall in the amount of increase among the 30 nations. The average one-year growth rate of the countries that outperformed the U.S. in the past year is nearly 60 percent higher, and the growth rate of the top performing country, Denmark, is 114 percent higher than that of the U.S. Even South Korea, a very early broadband leader that in theory should be closer to market saturation, outperformed the U.S.'s growth over the past year.[38]
- **The growth trends indicate that the U.S. is likely to continue to fall behind the rest of the world in broadband penetration**, which will have lasting and significant effects on the U.S. economy.

Price and Speed

Even if we were able to match the world leaders in penetration rates, we cannot touch the speed and value (cost per unit of speed) they offer their consumers. The value of U.S. connections is alarmingly below other countries.

- Where U.S. consumers routinely pay about $10 per month per mbps (megabit per second), citizens in countries like Japan, South Korea, Sweden and France pay less that $1 per month per mbps.
- A 50 mbps connection in Japan costs $30 per month. Such speeds are not even available in the U.S. American customers can expect to pay $20 to 30 per month for (at best) 3 mbps of DSL connectivity or between $40 to 50 per month for 4 to 8 mbps of cable modem connectivity. [39]
- A French company offers the "triple play" -- 50 mbps of symmetrical broadband service, unlimited telephony and cable television -- for 30 euros per months. Neither this level of service nor this price point is available in the U.S. by a wide margin. [40]

Addressing the Critiques of OECD Data

We have analyzed various arguments which seek to discredit the OECD international broadband rankings, and persuade policy makers that all is well. We took their arguments seriously but found them lacking in each case. Here are a few key points:

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[37] Organization for Economic Cooperation and Development (OECD), "OECD Broadband Statistics to December 2006," April 23, 2006, Available at http://www.oecd.org/sti/ict/broadband

[38] *Ibid.*

[39] Grant Gross, "U.S. customers pay considerably more than the Japanese for bandwidth," IDG, 4 April 2007, http://www.infoworld.com/archives/emailPrint.jsp?R=printThis&A=/article/07/04/04/HNjapbroadband_1.html

[40] "Neuf Offers 50 Mbps in Paris for 30 EUR per month," *MuniWireless*, 7 March 2007, http://www.muniwireless.com/article/articleview/5771/1/2/

- Critics assert that the OECD's methodology does not account for special access lines (a type of broadband data platform that is typically subscribed to by large business customers). We could not verify this with OECD. But if this is indeed the case, it would not influence the U.S. ranking in the OECD tabulation. Using FCC data, and assigning a generous one million "missing" special access lines[41], this would change the U.S.'s December 2006 OECD penetration level from 19.6 to 19.9, still behind 14th ranked Japan, which has 20.2 subscribers per 100 inhabitants. **Thus this possible omission by the OECD does not appear to impact the overall results.**
- Geographic factors like population density are often assigned the blame for the poor U.S. broadband performance. Despite the intuitive logic of this argument, the data simply do not show this to be the case – **econometric analysis shows that geographic factors play little if any role in explaining the U.S. broadband performance relative to other countries**. There is absolutely no correlation between international broadband penetration and population density.[42] Five of the 14 countries with higher broadband penetration levels have lower population densities than the U.S. There is a very weak relationship between international broadband penetration and the percentage of a country's population living in urban areas. But the U.S. is a relatively urban nation, with 79 percent of the population living in urban areas (close to South Korea, whose has an urban population of 80 percent, and which is often held up mistakenly as a counterpoint to U.S. urbanicity). Factors like median household income and poverty play a much larger role in explaining international broadband performance. **When income and poverty are controlled for in econometric models, population density and urban percentage have absolutely no explanatory effect on broadband penetration.**
- We have also seen the OECD data compared to Pew data that puts U.S. household broadband penetration at 42 percent in 2006. This appears to compare favorably to a European Commission (EC) survey that puts the EU 25 household penetration at 23 percent.
  - However, the Pew data is percentage of *adults* with broadband access at home, while the EC's is *households*.
  - The EU 25 includes developing countries that should not be directly compared with the U.S.
  - Using official FCC data (a census of all lines) and U.S. Census Bureau data, the U.S. household broadband penetration is just under 45 percent. According to this data, the bottom three performing U.S. states are hovering above 20 percent household penetration.
- We have seen arguments that inter-model competition (i.e. competition between technologies) is lacking in other nations, and thus the U.S. is poised for some sort of "just around the corner" broadband wonderland. **However, several of the nations ahead of the U.S. in the OECD ranking do have appreciable levels of platform diversity *and* they also have significant amounts of competition within each platform -- something the U.S. lacks.** Countries like Denmark, The Netherlands, South Korea, Sweden, Belgium, Canada and Japan all have significant amounts of second- and third-platform broadband technologies. In fact, in seven of the 14 countries ahead of the U.S. in the OECD rankings, the leading platform has a market share of 62 percent or less. This is very close to the share of the cable platform in the U.S., which is 52 percent in the latest OECD data.

[41] We say "generous" because the most recent FCC data shows just over 600,000 traditional wireline business lines, the category special access lines falls under.

[42] S. Derek Turner, "Broadband Reality Check II," Free Press, Consumers Union, and Consumer Federation of America, August 2006, Available at http://www.freepress.net/docs/bbrc2-final.pdf.

- On the question of speed/price comparisons with the world leaders, there is little counterevidence. Verizon currently offers the fastest connection that we could find commercially advertised. **According to Verizon's Web site, their fastest fiber offering is 30 mbps download/5 mbps upload, for a whopping $179.95 per month**, plus fees and taxes. In contrast, fiber offerings from Japan are routinely 100 mbps *symmetrical*, and under $50 per month.

Appendix C – State by State Broadband Data

Source: Free Press analysis; Note: All data based on number of residential lines in each state reported in FCC Form 477 as of June 30 2006. Percentages assume one line per household, based on U.S. Census household estimates as of July 1 2006 (2002 data based on June 30 2002 Form 477 data and July 1 2002 Census household estimate)

State	Percent of Homes Subscribing to Broadband (2006)	Rank
Hawaii	61.1	1
New Jersey	60.7	2
Connecticut	59.9	3
Massachusetts	57.3	4
California	56.8	5
New Hampshire	56.8	6
Maryland	53.3	7
Rhode Island	52.6	8
New York	51.8	9
Delaware	51.4	10
Nevada	50.4	11
Florida	48.2	12
Washington	47.9	13
Colorado	47.9	14
Oregon	47.5	15
Kansas	46.9	16
Virginia	46.1	17
DC	45.0	18
Arizona	45.0	19
Alaska	44.4	20
Georgia	44.1	21
Illinois	44.0	22
Texas	43.8	23
Nebraska	42.9	24
Minnesota	42.8	25
Maine	41.6	26
Utah	41.1	27
Pennsylvania	40.8	28
Ohio	40.2	29
Vermont	40.2	30
Wisconsin	39.0	31
Missouri	38.9	32
Indiana	37.6	33
Oklahoma	37.0	34
Michigan	36.8	35
Louisiana	36.1	36
Wyoming	35.6	37
South Carolina	34.5	38
Tennessee	33.5	39
Montana	33.4	40
North Carolina	33.3	41
Iowa	32.5	42
Kentucky	31.7	43
Idaho	31.4	44
West Virginia	30.8	45
Arkansas	30.1	46
New Mexico	29.8	47
Alabama	29.4	48
South Dakota	21.3	49
North Dakota	20.4	50
Mississippi	20.2	51
Nationwide	**44.6**	

State	Percent of Homes Subscribing to Broadband in 2002	Percent of Homes Subscribing to Broadband in 2006	Percentage Point Change 2002 to 2006	Improvement Rank
New Jersey	14.5	60.7	46.2	1
New Hampshire	18.9	56.8	37.9	2
Connecticut	22.2	59.9	37.8	3
Maryland	16.4	53.3	36.9	4
Delaware	16.2	51.4	35.3	5
California	21.7	56.8	35.1	6
Nevada	16.7	50.4	33.7	7
Massachusetts	23.8	57.3	33.5	8
Colorado	14.7	47.9	33.2	9
Rhode Island	19.9	52.6	32.8	10
Virginia	14.4	46.1	31.8	11
Illinois	13.5	44.0	30.6	12
Washington	17.4	47.9	30.5	13
Indiana	7.3	37.6	30.3	14
Oregon	17.2	47.5	30.2	15
DC	14.9	45.0	30.1	16
Florida	18.5	48.2	29.7	17
Pennsylvania	11.1	40.8	29.7	18
Kansas	17.5	46.9	29.4	19
Maine	12.4	41.6	29.2	20
Wyoming	6.7	35.6	28.9	21
Montana	5.0	33.4	28.4	22
Missouri	10.5	38.9	28.4	23
Vermont	12.0	40.2	28.2	24
Texas	15.9	43.8	27.9	25
Arizona	17.1	45.0	27.9	26
Minnesota	15.5	42.8	27.2	27
New York	24.8	51.8	27.0	28
Kentucky	4.9	31.7	26.7	29
Utah	14.5	41.1	26.6	30
Georgia	17.6	44.1	26.5	31
Ohio	14.1	40.2	26.1	32
Nebraska	16.8	42.9	26.0	33
Wisconsin	14.4	39.0	24.6	34
Oklahoma	13.7	37.0	23.3	35
Iowa	9.8	32.5	22.7	36
New Mexico	7.4	29.8	22.4	37
Alaska	22.6	44.4	21.9	38
Louisiana	14.4	36.1	21.7	39
South Carolina	12.8	34.5	21.7	40
Michigan	15.2	36.8	21.6	41
Idaho	9.9	31.4	21.5	42
Arkansas	8.9	30.1	21.2	43
West Virginia	10.1	30.8	20.7	44
Tennessee	14.4	33.5	19.1	45
Alabama	11.8	29.4	17.6	46
North Carolina	16.2	33.3	17.0	47
South Dakota	5.7	21.3	15.7	48
Mississippi	6.8	20.2	13.4	49
North Dakota	7.4	20.4	13.0	50
Hawaii	N/A	61.1	N/A	N/A
Nationwide	**16.0**	**44.6**	**28.6**	

Source: Free Press analysis; Note: All data from FCC Form 477 as of June 30 2006; percent rural population data from U.S. Census Bureau

Cable Modem Availability Where Cable Systems Offer Cable TV Service (% of end user premises)				Percent Rural Pop	xDSL Availability Where ILECs Offer Local Telephone Service (% of residential end user premises)				Percent Rural Pop	Percent of Telephone Lines that are RBOC
State	Jun-05	Dec-05	Jun-06		State	Jun-05	Dec-05	Jun-06		
New Jersey	96.8%	96.8%	99.9%	5.6%	New Jersey	86.8%	88.0%	88.0%	5.6%	75.7%
Massachusetts	98.3%	98.9%	98.9%	8.6%	Florida	84.6%	85.6%	88.0%	10.7%	65.0%
New York	98.3%	97.3%	98.8%	12.5%	Louisiana	85.3%	85.2%	87.4%	27.4%	74.3%
Maryland	94.1%	97.3%	97.6%	13.9%	Georgia	77.0%	83.7%	87.3%	28.4%	65.6%
California	96.6%	97.7%	97.2%	5.6%	North Dakota	81.3%	83.7%	86.2%	44.1%	33.3%
Illinois	96.9%	98.4%	97.2%	12.2%	Nebraska	52.0%	70.7%	86.1%	30.2%	29.4%
Wisconsin	96.5%	N/A	96.3%	31.7%	California	84.1%	84.8%	85.9%	5.6%	80.8%
Missouri	88.9%	89.4%	96.0%	30.6%	Nevada	81.2%	84.0%	85.3%	8.5%	25.7%
Florida	93.7%	97.1%	95.9%	10.7%	Kentucky	59.8%	74.3%	84.5%	44.2%	42.1%
Virginia	94.6%	95.9%	95.9%	27.0%	Iowa	77.3%	80.5%	83.1%	38.9%	51.8%
Colorado	87.3%	95.9%	95.8%	15.5%	North Carolina	74.9%	78.8%	82.7%	39.8%	44.8%
Tennessee	94.9%	97.0%	95.2%	36.4%	Pennsylvania	74.3%	76.2%	82.5%	22.9%	62.2%
Texas	86.6%	88.1%	95.1%	17.5%	Utah	77.7%	80.1%	82.1%	11.8%	68.6%
Ohio	97.7%	96.4%	94.8%	22.6%	Colorado	74.3%	80.2%	82.0%	15.5%	76.6%
North Carolina	95.4%	96.1%	94.8%	39.8%	Minnesota	75.9%	78.5%	81.1%	29.1%	50.1%
Indiana	92.9%	96.1%	94.0%	29.2%	Ohio	73.0%	78.7%	81.0%	22.6%	56.6%
Washington	92.4%	93.0%	93.6%	18.0%	Oregon	77.1%	79.2%	80.7%	21.3%	71.2%
Pennsylvania	89.5%	92.5%	93.5%	22.9%	Tennessee	79.8%	80.2%	80.7%	36.4%	63.0%
Michigan	98.0%	98.3%	91.7%	25.3%	Washington	74.8%	78.4%	80.1%	18.0%	75.0%
Arizona	85.0%	95.3%	91.4%	11.8%	Kansas	77.5%	78.6%	79.5%	28.6%	58.4%
Nebraska	90.8%	91.4%	91.4%	30.2%	South Carolina	73.3%	75.6%	78.2%	39.5%	57.9%
Alabama	91.1%	95.3%	90.9%	44.6%	New York	80.9%	80.1%	78.1%	12.5%	59.2%
Minnesota	88.6%	95.5%	90.8%	29.1%	Alabama	75.7%	76.5%	78.1%	44.6%	63.0%
Kentucky	86.7%	88.5%	90.6%	44.2%	Illinois	76.6%	76.8%	77.9%	12.2%	75.2%
Oregon	89.7%	89.7%	89.7%	21.3%	Alaska	72.0%	75.4%	77.9%	34.4%	0.0%
Maine	82.9%	85.8%	89.1%	59.8%	Wyoming	70.1%	73.7%	77.3%	34.9%	68.3%
Georgia	88.3%	92.3%	89.1%	28.4%	Wisconsin	75.1%	76.6%	76.1%	31.7%	54.4%
Iowa	85.0%	91.9%	88.5%	38.9%	Montana	70.5%	70.8%	76.1%	45.9%	55.8%
West Virginia	82.2%	82.4%	88.2%	53.9%	South Dakota	72.9%	72.6%	76.0%	48.1%	34.9%
Oklahoma	80.1%	84.5%	87.6%	34.7%	Idaho	68.1%	69.7%	75.6%	33.6%	81.1%
Louisiana	93.6%	55.6%	87.1%	27.4%	Texas	71.5%	74.2%	75.4%	17.5%	69.4%
Kansas	86.8%	87.4%	86.1%	28.6%	Maryland	75.6%	77.1%	75.1%	13.9%	80.8%
South Carolina	79.3%	82.7%	84.2%	39.5%	Oklahoma	72.4%	73.1%	75.0%	34.7%	61.8%
Connecticut	83.0%	83.4%	83.7%	12.3%	New Mexico	71.8%	75.5%	75.0%	25.0%	78.0%
Montana	21.0%	87.1%	83.3%	45.9%	Indiana	70.7%	72.7%	74.2%	29.2%	74.4%
Idaho	77.6%	82.8%	83.3%	33.6%	Mississippi	72.6%	73.0%	73.5%	51.2%	80.5%
New Hampshire	95.6%	81.6%	82.8%	40.7%	Missouri	68.3%	68.6%	71.9%	30.6%	59.8%
New Mexico	71.6%	74.8%	79.5%	25.0%	West Virginia	56.9%	61.2%	68.3%	53.9%	70.9%
North Dakota	79.2%	89.1%	79.4%	44.1%	Maine	69.9%	67.2%	67.0%	59.8%	62.3%
Mississippi	76.9%	91.9%	78.9%	51.2%	Arizona	61.2%	64.5%	66.9%	11.8%	63.4%
Arkansas	64.6%	67.1%	77.3%	47.5%	Michigan	64.8%	65.1%	66.4%	25.3%	73.3%
South Dakota	62.1%	N/A	58.5%	48.1%	Virginia	66.0%	66.9%	65.6%	27.0%	66.7%
Alaska	N/A	N/A	N/A	34.4%	Arkansas	57.2%	62.9%	65.6%	47.5%	56.5%
DC	N/A	N/A	N/A	0.0%	Vermont	64.4%	61.3%	59.9%	61.8%	71.1%
Delaware	N/A	N/A	N/A	19.9%	New Hampshire	65.0%	62.6%	59.4%	40.7%	67.8%
Hawaii	N/A	N/A	N/A	8.5%	Connecticut	N/A	N/A	N/A	12.3%	84.3%
Nevada	N/A	N/A	N/A	8.5%	DC	N/A	N/A	N/A	0.0%	82.7%
Rhode Island	N/A	N/A	N/A	9.1%	Delaware	N/A	N/A	N/A	19.9%	80.0%
Utah	N/A	N/A	N/A	11.8%	Hawaii	N/A	N/A	N/A	8.5%	0.0%
Vermont	N/A	N/A	N/A	61.8%	Massachusetts	N/A	N/A	N/A	8.6%	73.8%
Wyoming	N/A	N/A	N/A	34.9%	Rhode Island	N/A	N/A	N/A	9.1%	54.7%
Nationwide	91.1%	92.6%	93.1%	21.1%	Nationwide	75.9%	77.7%	79.3%	21.1%	66.7%

Appendix D – Michigan Broadband Data