Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion	GN Docket No. 20-269

REPLY COMMENTS OF THE MASSACHUSETTS DEPARTMENT OF TELECOMMUNICATIONS AND CABLE

Commonwealth of Massachusetts
Department of Telecommunications and Cable

KAREN CHARLES PETERSON
COMMISSIONER

1000 Washington Street, Suite 600
Boston, MA 02118-6500
(617) 305-3580

Dated: October 5, 2020

TABLE OF CONTENTS

I. SUMMARY 2

II. THE FCC'S PROPOSED RELIANCE ON FORM 477 DATA WILL FAIL TO ACCURATELY DETERMINE WHETHER ADVANCED TELECOMMUNICATIONS CAPABILITY IS BEING OFFERED TO ALL AMERICANS. 4

a. FORM 477 DATA IS INACCURATE AND UNVERIFIED. 4

b. THE FCC'S PROPOSED DEFINITIONS OF FIXED BROADBAND AND MOBILE BROADBAND DO NOT CONSTITUTE "ADVANCED TELECOMMUNICATIONS CAPABILITIES." 7

c. THE FCC SHOULD CONSIDER AFFORDABILITY WHEN EVALUATING THE AVAILABILITY OF ADVANCED TELECOMMUNICATIONS CAPABILITY 9

III. THE FCC SHOULD OBTAIN AND REPORT PRICE DATA IN ORDER TO ENABLE A SUBSTITUTABILITY ANALYSIS OF FIXED AND MOBILE BROADBAND. 10

IV. CONCLUSION 13

APPENDIX i

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of Inquiry Concerning Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion	GN Docket No. 20-269

REPLY COMMENTS OF THE MASSACHUSETTS DEPARTMENT OF TELECOMMUNICATIONS AND CABLE

The Massachusetts Department of Telecommunications and Cable ("MDTC")[1] respectfully submits these comments in response to the Sixteenth Broadband Deployment Report Notice of Inquiry.[2] The FCC initiated the NOI to solicit data and information to assist in its annual task required by Section 706 of the Telecommunications Act of 1996, as amended ("Section 706"),[3] to determine whether broadband is being deployed to all Americans in a reasonable and timely fashion (the "Inquiry").[4] In the NOI, the FCC seeks comments on several issues related to interpreting Section 706 and measuring the availability and deployment of broadband service.[5]

---

1 The MDTC is the exclusive state regulator of telecommunications and cable services within the Commonwealth of Massachusetts. MASS. GEN. LAWS ch. 25C, § 1.

2 *In re Inquiry Concerning Deployment of Advanced Telecomms. Capability to All Ams. in a Reasonable & Timely Fashion*, GN Docket No. 20-269, Sixteenth Broadband Deployment Report Notice of Inquiry, FCC 20-112 (rel. Aug. 19, 2020) ("NOI").

3 Telecommunications Act of 1996 § 706(b), 47 U.S.C. § 1302(b).

4 NOI ¶ 2.

5 *Id.* Because the FCC distinguishes the terms "broadband" and "advanced telecommunications capability" in the NOI, we use the term "broadband" herein to refer only to broadband which meets the FCC's proposed definition of "advanced telecommunications capability," namely fixed broadband which meets the speed

I. SUMMARY

While the FCC proposes an inquiry virtually identical to the inquiry it conducted last year,[6] Americans' circumstances and use of broadband service have changed substantially, largely as a result of the COVID-19 pandemic.[7] American households' *mean* daily data usage increased 36% between the second quarters of 2019 and 2020.[8] But *median* household data usage increased even more over this period, up 54%, indicating that many households have significantly increased their data usage.[9] Now is the time for the FCC to conduct a Section 706 Inquiry that accurately reflects the ways in which advanced telecommunications capability is being deployed, and to which Americans.

---

benchmarks of 25 Mbps download and 3 Mbps upload and mobile broadband which meets the speed benchmarks of 5 Mbps download and 1 Mbps upload, unless otherwise indicated. *See id.* ¶¶ 3 n.2, 11, 12.

[6] *See, e.g., id.* ¶ 4 ("once again" the NOI proposes to use a "progress-based approach"), ¶ 6 ("Consistent with past Broadband Deployment Reports, we propose to take a holistic view of progress…."), ¶ 9 ("We propose maintaining the evaluative framework we used in the 2020 Report."), ¶ 9 ("We also propose to continue to rely on a five-year time period (2015-2019) in our analysis."), ¶ 9 (with respect to fixed broadband speed metrics, "[w]e propose to use these same metrics for our upcoming Report…."), ¶ 11 ("We propose to maintain the 25/3 Mbps benchmark for fixed services…."), ¶ 13 (with respect to evaluating the availability of advanced telecommunications capability in elementary and secondary schools and classrooms, the NOI proposes "to continue using these goals for the upcoming Report…."), ¶ 16 ("We therefore propose to continue to use the FCC Form 477 data to evaluate deployment of fixed broadband services."), ¶ 25 ("…we again propose to continue to rely on the mobile broadband coverage data from the FCC Form 477 collection for the upcoming *Report*."), and ¶ 26 ("We propose to use the same methodology as we used in the 2019 and 2020 Reports to calculate where advanced telecommunications capability is deployed.").

[7] *Cf.* Local Solutions Support Center, "The Digital Divide, Broadband Access, and the Pandemic," July 22, 2020, https://www.supportdemocracy.org/the-latest/the-digital-divide-broadband-access-and-the-pandemic ("The COVID-19 crisis has forced our country to completely restructure the way many of us live, work, and learn, and access to broadband has become essential to advancing public health, education and equity."); Doug Kinkoph, U.S. Dep't of Commerce, Broadband is More Important Than Ever (Apr. 8, 2020), https://www.commerce.gov/news/blog/2020/04/broadband-more-important-ever; Letter from Jonathan Spalter, President and CEO, USTelecom | The Broadband Association, to FCC Commissioners (Mar. 27, 2020), WC Docket No. 01-92 ("The effects from the inability to access or afford broadband access are particularly acute during this national health crisis. Therefore, it is essential that industry and government work together in partnership to do everything we can to make sure every American has access to broadband.").

[8] OpenVault, "OVBI: Upstream Broadband Usage, Faster Speeds Spike Higher in Q2 2020," https://openvault.com/ovbi-upstream-broadband-usage-faster-speeds-spike-higher-in-q2-2020/ (cited in POTS and PANs, "Data Usage Remains Robust in 2Q20," Aug. 25, 2020, https://potsandpansbyccg.com/2020/08/25/data-usage-remains-robust-in-2q20/?mc_cid=74d9987b0b&mc_eid=c88acbaf80).

[9] *Id.*

The MDTC is concerned that the FCC's proposed inquiry will not meet the statutory requirements of 47 U.S.C. § 1302(b). Although the statute does not specify the manner in which the FCC is to conduct its inquiry, the MDTC asserts that it would be arbitrary and capricious for the FCC to make this determination based solely on Form 477 data for several reasons. First, some of this data has been proven to be inaccurate, as the FCC has acknowledged and many third party experts have elucidated, and is largely unverified. Second, the NOI's proposed definitions of fixed and mobile broadband, particularly the proposed upload speed minimums, no longer meet the statutory definition of "advanced telecommunications capability."[10] Third, because the NOI includes no measure of either the cost or the affordability of broadband services, the proposed inquiry would fail to determine these services' functional availability to Americans. Indeed, the MDTC believes that Section 706 requires that the determination of the availability of advanced telecommunications capability include functional availability, in addition to physical availability.[11] For these reasons, the MDTC encourages the FCC to (i) use data other than or in addition to Form 477 data, (ii) change its definitions of fixed broadband and mobile broadband to include greater speed minimums, and (iii) collect price data for broadband services, and (iv) conduct affordability analyses based on these prices and American households' financial resources and use of and need for broadband service.

In addition, the MDTC supports the FCC's proposal to recognize a distinction between fixed and mobile advanced telecommunications capability for purposes of its Section 706 analysis.[12] Massachusetts consumers rely on both fixed and mobile broadband, using the

---

10 47 U.S.C. § 1302(d)(1).

11 *See id.* § 1302(b).

12 NOI ¶ 8.

services for different purposes. But the FCC's proposed analytical structure with which to account for this distinction—to examine the deployment of fixed, mobile, fixed and mobile, and fixed or mobile broadband—will not provide data that would allow the FCC or others to measure the substitutability of fixed and mobile broadband. Economists determine the substitutability of two goods or services by calculating their cross elasticity of demand. This analysis requires price data. For this reason as well, the MDTC encourages the FCC to include price data in its Section 706 examination and to make price data available to states—on a confidential basis, if necessary—to allow the FCC and states to examine whether any level of substitutability exists between fixed and mobile broadband across various geographies and demographics.

II. THE FCC'S PROPOSED RELIANCE ON FORM 477 DATA WILL FAIL TO ACCURATELY DETERMINE WHETHER ADVANCED TELECOMMUNICATIONS CAPABILITY IS BEING OFFERED TO ALL AMERICANS.

The NOI's proposed reliance on Form 477 data would not allow the FCC to accurately determine whether advanced telecommunications capability is being extended to all Americans in a timely manner, because this data contains inaccuracies and is unverified, relies on outmoded definitions of fixed broadband and mobile broadband, and fails to measure American households' actual capability to access these services.

a. FORM 477 DATA IS INACCURATE AND UNVERIFIED.

The NOI's proposed reliance on Form 477 data that the FCC[13] and others have repeatedly admitted is inaccurate[14] and unverified would undermine any conclusions drawn therefrom. At a

[13] *In re Establishing a 5G Fund for Rural Am.*, GN Docket No. 20-32, Notice of Proposed Rulemaking and Order (rel. Apr. 24, 2020) ¶ 34; *see also* NOI ¶ 16.

[14] *See, e.g.*, Arthur Scott, "Understanding the True State of Connectivity in America," Mar. 1, 2020, https://www.naco.org/resources/featured/understanding-true-state-connectivity-america (using a speed test app, "TestIT," to show that mean mobile and fixed wireless internet speeds fell below the FCC's speed standard for broadband service in most American counties, despite contrary claims on Form 477); Vt. Dep't of Pub. Serv.,

minimum, the FCC should incorporate speed-test options for fixed broadband services into its inquiry, in order to provide more accurate data and some estimation of the size and direction of the Form 477 data's inaccuracy.

While the MDTC applauds the FCC's implementation of basic data accuracy checks[15] following the FCC's discovery that it had used inaccurate fixed broadband subscription data for several years as a result of one provider's missing or inaccurate Form 477 submissions,[16] this fix is likely to catch only the most obviously fraudulent or incorrect provider data. The FCC still has no mechanism to systematically verify provider claims contained in their Forms 477. And yet the accuracy of this data will be determinative for the FCC to conclude whether or not advanced telecommunications capability is being deployed to all Americans in a reasonable and timely fashion.

The problems with using Form 477 data to make this determination go beyond those structural limitations of the Form 477 that the FCC acknowledges. For example, if a provider reports that it offers fixed broadband service to the consumers of a given census block, the FCC proposes to conclude that all of the households in that census block receive advanced telecommunications capability even though that service may be available to only a single

---

Mobile Wireless in Vermont 1 (Jan. 15, 2019), https://publicservice.vermont.gov/content/mobile-wireless-drive-test-reportjanuary-2019 (using drive testing of 4G LTE coverage in Vermont to show that, even having measured only along major roads, at least 15% of Vermont's territory lacked qualifying 4G LTE service, as opposed to the 5% providers reported on Form 477); The Center for Rural Pennsylvania, "Broadband Availability and Access in Rural Pennsylvania," June 2019, https://www.rural.palegislature.us/broadband/Broadband_Availability_and_Access_in_Rural_Pennsylvania_2019_Report.pdf (collecting 11 million consumer speed tests and determining that median broadband download speeds were less than those claimed in FCC Form 477 data in every county in Pennsylvania).

[15] *See* NOI ¶ 17 n.50.

[16] *In re Barrier Comm. Corp., d/b/a BarrierFree*, File No. EB-IHD-19-00029003, Notice of Apparent Liability for Forfeiture (rel. Sept. 2, 2020) ¶ 2 n.1.

household in that census block.[17] Even if that service was available throughout the census block, the FCC has no means by which to verify several important details of the availability, including: the technological or logistical capability of each household in the census block to subscribe to that service; whether households are receiving service at the speeds to which they subscribed; and whether households are receiving such speeds consistently and during peak usage periods. These factors may explain why, while the FCC concluded in April 2020 that its 25/3 and 5/1 Mbps speed minimums are sufficient,[18] more than 61% of American households have chosen to subscribe to service with speeds of at least 100 Mbps.[19] At a time when broadband access is no longer just a convenience, but critical to work, learning, health, and social connection for millions of Americans, the FCC's reliance on unverified data to reach its conclusion on the state of advanced telecommunications capability is inadequate.

While it is unfortunate that the FCC did not issue rules for a more accurate data collection process prior to this Inquiry,[20] at a minimum, the FCC should include in this Inquiry a crowdsourcing or other form of challenge mechanism for fixed broadband service, which could be similar to that which it has adopted for mobile broadband service.[21] Free home speed tests are

---

17 NOI ¶ 17.

18 *In re Inquiry Concerning the Deployment of Advanced Telecomms. Capability to All Ams. in a Reasonable & Timely Fashion*, GN Docket No. 19-285, 2020 Broadband Deployment Report (rel. Apr. 14, 2020) ("2020 Broadband Deployment Report") ¶¶ 13-14.

19 *See supra* n.8.

20 *See Establishing the Digital Opportunity Data Collection*, WC Docket Nos. 19-195, 11-10, Second Report and Order and Third Further Notice of Proposed Rulemaking, FCC 20-94; *Establishing the Digital Opportunity Data Collection*, WC Docket Nos. 19-195, 11-10, Report and Order and Second Further Notice of Proposed Rulemaking, 34 FCC Rcd. 7505 (2019). The MDTC notes that this Inquiry is being conducted much earlier in the calendar year than was last year's Section 706 Inquiry. *See In re Inquiry Concerning Deployment of Advanced Telecomms. Capability to All Ams. in a Reasonable & Timely Fashion*, GN Docket No. 19-285, Fifteenth Broadband Deployment Report Notice of Inquiry, FCC 19-102 (rel. Oct. 23, 2019) (containing a comment deadline of November 22, 2019, as opposed to the NOI's comment deadline of September 18, 2020).

21 *Id.* ¶ 12.

widely available and continue to improve their accuracy.[22] The MDTC urges the FCC to supplement providers' Form 477 fixed broadband availability data with speed-test data.

b. THE FCC'S PROPOSED DEFINITIONS OF FIXED BROADBAND AND MOBILE BROADBAND DO NOT CONSTITUTE "ADVANCED TELECOMMUNICATIONS CAPABILITIES."

Further, the NOI's proposals to define fixed broadband to include those fixed broadband services with upload speeds equal to or greater than 3 Mbps, and mobile broadband to include those mobile broadband services with upload speeds equal to or greater than 1 Mbps are inadequate.[23] These definitions would include services that do not meet the statutory definition of "advanced telecommunications capabilities," because they do not enable users to "originate . . . high-quality voice, data, graphics, and video telecommunications."[24]

In its most recent Section 706 Report issued in 2020, the FCC found that since the adoption of the 25/3 Mbps benchmark in 2015, "the speed required for the applications that most broadband consumers use has not changed substantially . . . and actual subscriptions have not yet consistently surpassed the benchmark level."[25] Currently, neither of those conclusions remains true. First, as noted above, more than 61% of American households subscribe to fixed broadband service with speeds of at least 100 Mbps.[26] In addition, many American households now use video conferencing daily, with members of the same household often conducting

---

22 *See, e.g.*, Lai Yi Ohlsen, et al., Measurement Labs, "Introducing ndt7," July 22, 2020, https://www.measurementlab.net/blog/ndt7-introduction/#ndt7-introduction (introducing an improved network diagnostic tool based on a new ndt7 protocol).

23 NOI ¶ 11.

24 47 U.S.C. § 1302(d)(1).

25 2020 Broadband Deployment Report ¶ 13, citing WISPA Comments at 4-5.

26 *See supra* n.8.

multiple video conferences simultaneously.[27] This new upload demand can quickly exceed the NOI's proposed upload speed thresholds. For example, the upload bandwidth required to conduct a Zoom session with more than two participants at 1080p is 3 Mbps.[28] For those using Zoom on a mobile broadband connection, a number which had already increased to nearly five million daily users in the U.S. by the April 2020 Broadband Deployment Report,[29] a mobile broadband service with an upload speed of 1 Mbps would not satisfy this Zoom minimum speed requirement. Similarly, a fixed broadband service with 3 Mbps upload speed would not meet Zoom's required minimum upload speed if a parent is conducting a video conference for work while one child is attending one for school. Even assuming that no other applications are running, including IOT applications, and that the household's devices are receiving the service's maximum promised upload speed, the minimum upload speed of Zoom is not met.

It is clear that American households' bandwidth demands have surpassed what the NOI contemplated in its proposed definitions of fixed broadband and mobile broadband service. The upload speeds do not "enable[] users to originate . . . high-quality voice, data, graphics, and video telecommunications."[30]

---

[27] *See* Allen Bernard, Mobility, "How Coronavirus is Changing Internet Usage Patterns Worldwide," Mar. 20, 2020, https://www.techrepublic.com/article/how-the-coronavirus-is-changing-internet-usage-patterns-worldwide/.

[28] Zoom Help Center "System Requirements for Windows, macOS, and Linux," https://support.zoom.us/hc/en-us/articles/201362023-System-requirements-for-Windows-macOS-and-Linux#h_d278c327-e03d-4896-b19a-96a8f3c0c69c (last visited Sept. 9, 2020).

[29] Reuters, "Zoom's daily participants jumped from 10 million to over 200 million in 3 months (updated)," Apr. 2, 2020, https://venturebeat.com/2020/04/02/zooms-daily-active-users-jumped-from-10-million-to-over-200-million-in-3-months/.

[30] 47 U.S.C. § 1302(d)(1).

c. THE FCC SHOULD CONSIDER AFFORDABILITY WHEN EVALUATING THE AVAILABILITY OF ADVANCED TELECOMMUNICATIONS CAPABILITY.

The MDTC urges the FCC to adopt a functional-availability analysis for purposes of Section 706. In the *1999 First Broadband Deployment Report*, the FCC stated that availability "refers to a consumer's ability to purchase a capability that has been deployed."[31] Simply because a broadband connection is physically accessible to a consumer's home does not mean that the service is actually available to the consumer. If a household cannot afford broadband, broadband is not available to that household. Both Congress and the FCC have repeatedly stressed the need for deploying affordable broadband access to all Americans, as have many commenters in previous years' Section 706 proceedings.[32] One of the basic universal service principles Congress enumerated is that "[q]uality services should be available at just, reasonable, and *affordable* rates."[33] Nationally, there remains a stark, income-based digital divide between those capable and those incapable of accessing broadband services.[34]

Massachusetts consumer behavior strongly demonstrates the link between affordability and availability. The MDTC has tested the correlation between income and broadband subscription rates using a multiple regression analysis. The results (see Appendix) show a strong correlation between median household income and subscription rates to available fixed broadband services. This regression predicts that Massachusetts households earning $40,000

---

31 *In re Inquiry Concerning the Deployment of Advanced Telecomms. Capability to All Ams. in a Reasonable & Timely Fashion, & Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecomms. Act of 1996*, CC Docket No. 98-146, Report, 14 FCC Rcd. 2398, 2410 ¶ 30 (1999).

32 2020 Broadband Deployment Report ¶ 19 n.66.

33 47 U.S.C. § 254(b)(1) (emphasis added).

34 *See, e.g.*, Local Solutions Support Center, "The Digital Divide," https://static1.squarespace.com/static/5ce4377caeb1ce00013a02fd/t/5f21ef70fe52e1594ec0b65f/1596059506346/LSSC_Broadband_and_COVID19.pdf.

annually are only two-thirds as likely to subscribe to fixed broadband services (60.1%) as are households earning $100,000 annually (93.2%), all other variables being equal.

This correlation between income and subscription rates is statistically significant and highlights the large role affordability plays in fixed broadband availability.[35] Price data for fixed and mobile broadband would allow for an examination of whether MDTC's proven correlation reflects causation.[36] Regression analysis that also contained price data could narrow the focus on the relationship between income and subscription rates. Even without such price data, however, this data evidence of correlation should persuade the FCC of the need to incorporate affordability in its Section 706 analysis.

III. THE FCC SHOULD OBTAIN AND REPORT PRICE DATA IN ORDER TO ENABLE A SUBSTITUTABILITY ANALYSIS OF FIXED AND MOBILE BROADBAND.

The FCC believes that fixed and mobile broadband are "not yet functional substitutes for all uses and customer groups."[37] The MDTC agrees and urges the FCC to analyze this substitutability and collect the price data that would enable such an analysis. Specifically, the cross elasticity of demand examines the substitutability of goods or services by examining how changes in the price of one good affects demand for the other good.[38] Here, this would require

---

35 The MDTC is unable to test for correlation between income and mobile broadband subscribership because the Form 477 does not currently collect mobile broadband data at the census tract level and does not collect the necessary data about residents' mobile data plans.

36 For a further discussion of the necessity of price data, see *infra* Section III.

37 NOI ¶ 10.

38 *See* Walter Nicholson & Christopher Snyder, Microeconomic theory 187-192 (11th ed. 2012). The cross elasticity of demand formula can be expressed as: $E_c = \frac{P_1^A + P_2^A}{Q_1^B + Q_2^B} * \frac{\Delta Q^B}{\Delta P^A}$

Where: E_c = Elasticity

P_1^A = Price of good A at time 1

price and subscription data for fixed and mobile broadband in a designated geography over a set time period.

Consumers rely on both fixed and mobile broadband services, using each in distinct yet complementary ways, as both the FCC and industry observers recognize.[39] Although subscription data alone does not enable measurement of the substitutability of these services, recent Form 477 data may be explained by consumers' unwillingness to consider these services to be full substitutes. As of December 31, 2017, the FCC's latest broadband subscription report, there were 95.8 mobile broadband subscriptions per 100 residents nationally[40] and 50.1 fixed broadband subscriptions per 100 households.[41] The choice to subscribe to both fixed and mobile broadband is even more pronounced in Massachusetts where there were fully 101.1 mobile

---

P_2^A = Price of good A at time 2

Q_1^B = Quantity demanded of good B at time 1

Q_2^B = Quantity demanded of good B at time 2

ΔQ^B = Change in the quantity demanded of good B

ΔP^A = Change in the price of good A.

[39] *See* Comments of INCOMPAS, WC Docket No. 16-197 (Sept. 2, 2020) p. 15 ("[t]he Commission and the industry understand that mobile, 5G, and satellite are not yet substitutes for fixed broadband, which significantly undermines Charter's arguments of the competition it faces"); ANDRES V. LERNER & JANUSZ A. ORDOVER, AN ECONOMIC ANALYSIS OF TITLE II REGULATION OF BROADBAND INTERNET ACCESS PROVIDERS 36-37 (2017), contained in Comments of Verizon, *In re Restoring Internet Freedom*, GN Docket No. 17-108 (July 17, 2017) ("[C]onsumers generally do multi-home by accessing online content and services on multiple platforms, such as one or more wireless broadband services, a wireline broadband service at home, a wireline broadband service at work, and Wi-Fi networks at numerous locations (*e.g.*, Starbucks, libraries, airports).").

[40] Connections over 200 kbps in at least one direction. Calculated by the authors from Internet Access Services: Status as of December 31, 2017, Industry Analysis and Technology Division, Wireless Competition Bureau, FCC, Figure 34 (Nov. 2018), https://docs.fcc.gov/public/attachments/DOC-359342A1.pdf and U.S. Census Bureau, Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010 to July 1, 2018 (NST-EST2018-01), https://www.census.gov/data/tables/time-series/demo/popest/2010s-state-total.html.

[41] Connections of at least 25/3 Mbps. Calculated by the authors from Internet Access Services: Status as of December 31, 2017, Industry Analysis and Technology Division, Wireless Competition Bureau, FCC, Figure 32 (Nov. 2018), https://docs.fcc.gov/public/attachments/DOC-359342A1.pdf and U.S. Census Bureau, Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010 to July 1, 2018 (PEP_2018_PEPANNHU_US—States.Zip), https://www2.census.gov/programs-surveys/popest/tables/2010-2018/housing/totals/.

broadband subscriptions per 100 residents,[42] and 72.5 fixed broadband subscriptions per 100 households.[43] Price data would enable the FCC to test the hypothesis that these subscription patterns reflect the level of fixed and mobile broadband substitutability.

The difference between Massachusetts and U.S. subscription rates suggests that a higher share of Massachusetts residents choose to subscribe to both fixed and mobile broadband, which highlights the importance of measuring substitutability to Massachusetts in particular. The difference evidences the need for substitutability analyses with more granularity than nationally. Furthermore, sharing granular fixed and mobile broadband pricing data with the states would also allow states to combine this data with demographic data to estimate fixed and mobile broadband substitutability for specific income and other groups and at the local and regional levels.

The FCC already obtains fixed broadband price data for a small number of census tracts, through its annual Urban Rate Survey.[44] While detailed price data would provide a more comprehensive substitutability analysis, the FCC could combine its Urban Rate Survey data with mobile broadband subscription data to calculate estimated cross elasticities of demand for some census tracts. The MDTC encourages the FCC to include such an analysis in this year's Section

---

[42] Connections over 200 kbps in at least one direction. Calculated by the authors from Internet Access Services: Status as of December 31, 2017, Industry Analysis and Technology Division, Wireless Competition Bureau, FCC, Figure 34 (Nov. 2018), https://docs.fcc.gov/public/attachments/DOC-359342A1.pdf and U.S. Census Bureau, Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010 to July 1, 2018 (NST-EST2018-01), https://www.census.gov/data/tables/time-series/demo/popest/2010s-state-total.html.

[43] Connections of at least 25/3 Mbps. Calculated by the authors from Internet Access Services: Status as of December 31, 2017, Industry Analysis and Technology Division, Wireless Competition Bureau, FCC, Figure 32 (Nov. 2018), https://docs.fcc.gov/public/attachments/DOC-359342A1.pdf and U.S. Census Bureau, Annual Estimates of the Resident Population for the United States, Regions, States, and Puerto Rico: April 1, 2010 to July 1, 2018 (PEP_2018_PEPANNHU_US—States.Zip), https://www2.census.gov/programs-surveys/popest/tables/2010-2018/housing/totals/.

[44] *In re Connect Am. Fund*, WC Docket No. 10-90, Order, 28 FCC Rcd. 4242 (WCB and WTB 2013).

706 report, and collect more complete price data moving forward. This would allow both the FCC and states to examine the level and parameters of substitutability for various segments of the broadband consumer market. In addition to collecting this price data from providers, the MDTC suggests that the FCC collect price data independently, as it has done with mobile broadband speed data.[45]

The MDTC agrees that the FCC should continue examining the availability of fixed and mobile broadband as both separate and complementary services and urges it to include price data so that the extent of any substitutability can be quantified.

IV. CONCLUSION

In order to comply with its statutory obligation under Section 706, the FCC must use better data, update its definitions of fixed broadband and mobile broadband, collect price data for these services, and conduct affordability analyses based on these prices in light of American households' financial resources and use of and need for broadband service.

Respectfully submitted,

KAREN CHARLES PETERSON,
COMMISSIONER

By: /s/ *Mark A. Merante*
Mark A. Merante, Counsel II

/s/ *Jacob J. Levine*
Jacob J. Levine, Economist

Massachusetts Department of
Telecommunications and Cable
1000 Washington Street, Suite 600
Boston, MA 02118-6500
(617) 305-3580

October 5, 2020

[45] NOI ¶¶ 12, 21.

APPENDIX

Table 1. Regression of Consumer Fixed Broadband Subscription Rate on Median Household Income, by Census Tract

VARIABLES	Non-Satellite Fixed Broadband Subscription rate, at least 25/3 Mbps (% of households)
Median Household Income ($1000s)	0.553***
Median Household Income ($1000s) squared	-0.00191***
Minority Population (% of total population)	-0.0744***
Average Household Size	3.881*
Population over 65 (% of total population)	-0.274***
Population with at least a Bachelor's Degree (% of population over 25)	0.224***
Vacation Homes (as % of housing units)	-1.090***
Vacation Homes (as % of housing units) squared	0.0506***
Constant	39.83***
Observations	1,439
R-squared	0.633

*** p<0.01, ** p<0.05, * p<0.1

Subscription rates calculated by the authors from December 2017 FCC Form 477 data and U.S. Census Bureau / American FactFinder. "S1101: Households and Families" *2017 5-year estimates, American Community Survey*, U.S. Census Bureau's American Community Survey Office, 2017, Web 14 November 2019 <http://factfinder2.census.gov>; U.S. Census Bureau, American FactFinder, ACS Demographic and Housing Estimates, 2017 5-year estimates, American Community Survey, <https://factfinder.census.gov/bkmk/table/1.0/en/ACS/17_5YR/S1101/0400000US25.14000>. All other data from U.S. Census Bureau / American FactFinder. U.S. Census Bureau's American Community Survey Office, 2017. Web. November 2019 <http://factfinder2.census.gov>.

The MDTC tested whether median household income is correlated with the residential subscription rate for fixed broadband service in Massachusetts, calculated as the ratio of "consumer connections"[1] to households.[2] In order to control for demographic variables that might bias the results, the MDTC included in the regression the percentage of each census tract's population that: identified as non-white; was over 65 years old; and claimed to hold at least a bachelor's degree. It also included each tract's median household size and the percentage of each tract's households that the U.S. Census identified as seasonal or vacation homes. In addition to these demographic controls, the regression includes quadratic variables for median household income and the vacation home percentage in order to more precisely measure correlation at different levels of income.

These results show a strong, statistically significant direct correlation between household income and fixed broadband subscription rates among Massachusetts households, measured at the census tract level.[3] The negative coefficient on the quadratic of median household income means that this effect decreases slightly as income increases. For example, the first $10,000 increase in household income—from an annual income of $0 to an annual income of $10,000—

---

1 FCC, *Tract-Level Fixed Broadband Subscribership* (Dec. 2017) ("2017 Form 477 Data").

2 U.S. Census Bureau/American FactFinder "B25001: Housing Units" *2015 5-year estimates, American Community Survey*, U.S. Census Bureau's American Community Survey Office, 2015, Web 25 August 2017 <http://factfinder2.census.gov>; U.S. Census Bureau, American FactFinder, *ACS Demographic and Housing Estimates, 2015 5-year estimates, American Community Survey*, https://factfinder.census.gov/bkmk/table/1.0/en/ACS/15_5YR/DP05. All other data from U.S. Census Bureau / American FactFinder. U.S. Census Bureau's American Community Survey Office, 2015. Web. August 2017 <http://factfinder2.census.gov>.

3 FCC Form 477 data does not distinguish between census tracts in which fixed broadband is available throughout the tract and census tracts in which fixed broadband is available to only some households within the tract. In order to ensure that this ambiguity does not bias our results, we reran the regression with a binary variable for each county and an interaction variable between the county variables and median household income. The results were substantially unchanged.

is correlated with an increase in the rate of subscription to available fixed broadband of 5.34 percentage points, after controlling for age, race, educational attainment, household size, and vacation home percentage.[4] The effect is slightly less for the next $10,000 increase in household income: an increase from an annual income of $10,000 to an annual income of $20,000 is correlated with an increase in the rate of subscription to available fixed broadband of 4.96 percentage points, after controlling for age, race, educational attainment, household size, and vacation home percentage. This regression predicts that Massachusetts households earning $40,000 annually are only two-thirds as likely to subscribe to fixed broadband services (60.1%) as are households earning $100,000 annually (93.2%), all other variables being equal.

The demographic controls have the expected correlations.[5] These results are statistically significant at the 1% level, other than the results for household size, and the authors have tested for heteroskedasticity with the White test.

[4] The Constant predicts a subscription rate of 39.83 per 100 households at $0 income; therefore, the increase in the subscription rate correlated with an increase in household income from $0 to $10,000 predicts a subscription rate of 39.83 + 5.53 = 45.4%, *ceteris paribus*.

[5] Each one point increase in non-white percentage decreases the subscription rate by 0.07 percentage points while each one point increase in the percentage of the population 65 or older decreases the subscription rate by 0.27 percentage points. Each one point increase in the percentage of the population with at least a bachelor's degree increases the subscription rate by 0.22 percentage points while each increase of one person in median household size increases the subscription rate by 3.88 percentage points. All results are significant at the 1% level except household size, which is significant at the 10% level.