Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
A National Broadband Plan for Our Future	)	GN Docket No. 09-51

REPLY COMMENTS OF ADTRAN, INC.

Stephen L. Goodman
Butzel Long Tighe Patton, PLLC
1747 Pennsylvania Ave, NW
Suite 300
Washington, DC 20006
(202) 454-2851
SGoodman@butzeltp.com

Counsel for ADTRAN, Inc.

Dated: July 21, 2009

SUMMARY

The vast record compiled to date reflects the importance of this proceeding to our nation's future. ADTRAN in these Reply Comments addresses some of the technological issues included in the initial comments. In order to obtain favored status under the National Broadband Plan, several manufacturers or service providers touted particular broadband access technologies as the best solution for ubiquitous broadband deployment. Some of their claims were exaggerated, unsubstantiated, incomplete or inaccurate.

ADTRAN believes that it should not be the Commission's role to decide what is the "best" technology to incorporate into the National Broadband Plan. Rather, the Commission should leave it up to the service provider to determine, based on the specific economics in its service area, as well as customer demand, which technology (or technologies) to deploy. The Commission should set the bar high, and let technology innovators and service providers develop and deploy solutions from a full "tool box" that best suits the serving area topology

Wireless, satellite, wireline (both fiber and copper) and cable broadband each have positive and negative attributes. The specific topology and consumer demand should drive the technology a service provider chooses to deploy. Ultimately, it is the end user experience that matters most. However, in order for consumers to make rational choices, they must have meaningful information on the capabilities of different technologies. ADTRAN thus urges the Commission to develop a common metric (like the EPA's mileage measurements or the NHTSA's crash-worthiness tests) so that consumers can make an "apples-to-apples" comparison.

Table of Contents

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
A National Broadband Plan for Our Future	)	GN Docket No. 09-51

REPLY COMMENTS OF ADTRAN, INC.

ADTRAN, Inc. ("ADTRAN") takes this opportunity to reply to some of the initial comments submitted in response to the Commission's Notice of Inquiry to help develop a National Broadband Plan for the United States.[1] In recognition of the importance of this proceeding to the future of our nation, more than six thousand comments have been filed so far. As a telecommunications equipment manufacturer, ADTRAN seeks to help the Commission sift through some of the technical information and arguments incorporated in that vast record.

Like most of the commenting parties, ADTRAN shares the Commission's (and Congress') goal of developing a plan to foster the availability and adoption of broadband for all Americans. Much has already been done to make broadband available to most of the country, but as the comments point out, work remains to achieve the ultimate goal of ubiquitous broadband deployment and universal adoption by customers.

I. Introduction and Background

ADTRAN, headquartered in Huntsville, Alabama, is a leading global manufacturer of networking and communications equipment, with an innovative portfolio

---

[1] *A National Broadband Plan for Our Future* (Notice of Inquiry), 24 FCC Rcd 4342 (2009)(hereafter cited as "*NOI*").

of more than 1,700 solutions for use in the last mile of today's telecommunications networks. ADTRAN's equipment is deployed by some of the world's largest service providers, as well as distributed enterprises and small and medium businesses. Importantly for purposes of this proceeding, ADTRAN solutions enable voice, data, video and Internet communications across copper, fiber and wireless network infrastructures. Because of the breadth of its product lines, ADTRAN is not wedded to any one last-mile technology. Rather, ADTRAN believes that copper, fiber and wireless will all be necessary for the deployment of robust, ubiquitous and affordable broadband.

ADTRAN has a stake in the success of the Commission in this endeavor. As a broadband equipment manufacturer, ADTRAN stands to benefit from the rapid and widespread deployment and adoption of broadband services, because broadband service providers are likely to buy more equipment (and more equipment from ADTRAN) as greater broadband capacity is deployed to meet growing demand. ADTRAN thus wants the Commission to succeed in developing an effective national broadband plan. Moreover, as an American manufacturer with its research and development and most of its fabrication resources in Alabama, ADTRAN has an interest in the widespread deployment and adoption of broadband, insofar as these services will support education and job-training. ADTRAN will benefit from a more highly-skilled workforce as it expands to meet growing demand. Likewise, as an American business ADTRAN can compete more effectively world-wide to the extent health care costs can be reduced through use of electronic medical records and other health care improvements made possible by more robust and ubiquitous broadband networks.

For all these reasons, ADTRAN wants the Commission to develop a plan and take

whatever actions it can to help ensure the United States is a world leader in broadband deployment and adoption. As discussed in greater detail herein, technology exists currently to make broadband available everywhere. Market forces, avoidance or elimination of regulatory impediments, and in some cases government subsidies, should make it happen.

II. No Single Technology is the "Answer"

In their initial comments in this proceeding, several manufacturers and service providers touted particular broadband access technologies as the single solution to ubiquitous broadband deployment, presumably seeking a favored position in the National Broadband Plan. ADTRAN, on the other hand, acknowledges that each of the broadband technologies has benefits and detriments, and the "best" solution will vary based on a number of factors. ADTRAN believes that the service providers should determine what technology to deploy without the regulators putting a "thumb on the scale."

In advocating in favor of particular technologies, some of the commenting parties made claims that are exaggerated, unsubstantiated, incomplete or inaccurate. For example, satellite service providers Hughes and WildBlue assert that broadband satellite offers unparalleled coverage and cost-effectiveness using minimal infrastructure, while also providing service reliability and quality.[2] Iridium points to its (still-on-the-drawing board) next generation satellite system in claiming "its reliable, ubiquitous and advanced communications services, is an important part of ensuring that all Americans have

---

[2] Hughes/WildBlue Comments at p. ii.

broadband service."[3] ADTRAN recognizes that for some very sparsely populated or remote locations, satellite broadband may be the most economical alternative available. However, latency limits, capacity constraints and susceptibility to weather outages mean that satellite broadband is unlikely to support some applications, thus rendering it less than ideal.

In an effort to push last-mile fiber optic technology, the Fiber-to-the-Home Council claims that customers are already beginning to demand and will certainly require shortly at least 100 Mbps bi-directionally.[4] ADTRAN is currently experiencing strong success in the sales of its fiber-to-the-home products, but these solutions may not be economically viable for all deployment scenarios, and it may be some time before bi-directional 100 Mbps speeds will be required on a widespread basis. In any event, while fiber-to-the-home should be able to provide such capacity, advances in DSL technologies also allow fiber-to-the-node solutions to provide high capacity bandwidth with more favorable economics for many deployment scenarios (such as brownfield upgrades). Thus, fiber-to-the-home is not the only broadband technology that will be able to meet such demand if it materializes.

Wireless broadband proponents also made bold claims in touting their technology as deserving of special treatment in the National Broadband Plan. PureWave brashly asserted that wireless broadband is the best solution for bringing broadband service to

---

3 Iridium Comments at pp. 1-2.

4 FTTH Council Comments at p. 4.

rural and underserved areas.[5] The Wireless Communications Association International claims that that in rural areas the cost of fiber-to-the-home deployment would be "*20 times* the cost of 4G deployment." (emphasis in original)[6] ADTRAN notes that this WCA claim ignores the vast differences in capacity a subscriber will actually have access to on fiber-to-the-home versus 4G. Moreover, the comparison only looks at one aspect of "cost" and does not evaluate costs over time (where lower operating costs, longer service life and capacity scalability favor fiber-to-the-home).

In a similar vein, Alcatel-Lucent alleges that "infrastructure costs of spectrum-based services are frequently less significant than wired solutions."[7] To support this claim, Alcatel-Lucent cites to paragraph 142 of the *Rural Broadband Strategy Report*. However, as Windstream noted in its initial comments in this proceeding, the assertion of lower wireless costs in the *Rural Broadband Strategy Report* was without any valid support.[8] Such "bootstrapping" of claims of lower costs does not make it so.

Of course, wireline carriers are not immune from making bold claims in an effort to garner favorable treatment under the National Broadband Plan. OPASTCO asserts that wireline broadband technologies are inherently more capable than wireless of being upgraded to accommodate the capacity that will be needed in the near future.[9] While this may be true in most instances, wireless broadband for some deployments can complement

---

5 PureWave Comments at p. 4.

6 WCA Comments at p. 13.

7 Alcatel-Lucent Comments at p. 10.

8 Windstream Comments at p. 12.

9 OPASTCO Comments at pp. 13-16.

wireline broadband to the extent that mobility or portability is highly desired.

The point is that it should not be the Commission's role to determine which is the "best" technology to incorporate into the National Broadband Plan. Rather, in creating the National Broadband Plan the Commission should leave it up to the service provider to determine, based on the specific economics in its service area, as well as customer demand, which technology (or technologies) to deploy. The National Broadband Plan should not prejudge technologies and try to favor (or disfavor) any particular broadband technology. Instead, the Commission should make sure that service providers have the ability to select the most appropriate technology in each situation without a regulatory bias favoring or impeding that choice.

Several of the commenting parties share ADTRAN's belief that the National Broadband Plan should be technology neutral. For example, AT&T, Cisco and Telcordia all explicitly advocate technological neutrality.[10] In a similar vein, Qwest, in urging that the Commission adopt a reverse-bidding mechanism for broadband subsidies, explained that such an approach would be technologically and competitively neutral.[11]

As opposed to ADTRAN's and others' such requests for even-handed treatment, some of the commenting parties sought advantageous treatment under the National Broadband Plan. For example, Utopian Wireless urged the Commission to adopt different throughput minimums for fixed (20 Mbps) and mobile wireless (3 Mbps) broadband services, and the Wireless Communications Association indicated that if the

---

[10] *See* AT&T Comments at pp. 18-19; Cisco Comments at p. 15; Telcordia Comments at p. 4.

[11] Qwest Comments at p. 12.

FCC sets speed minimums, it should set lower thresholds for mobile wireless networks.[12] Other commenting parties advocated special treatment for mobile wireless broadband services, such as Clearwire claiming that mobile broadband should be treated as a separate and distinct service for purposes of determining "availability" – under this approach, an area would be considered "unserved" if the inhabitants had access to high speed fixed services, but not mobile broadband services.[13] In contrast, Windstream advocated that the same threshold speeds apply across technologies, with different speed tiers being used to rank applicants for purposes of subsidies, loans or grants.[14] ADTRAN agrees that the regulators should not be the ones picking winners or losers from amongst the differing broadband technologies, but instead those decisions should be made by the service providers (based on customer demand and their particular circumstances). No one technology is likely to prove best in all situations.

III. A Good End User Experience Is What Matters

As the record in this proceeding makes clear, service providers face a rash of trade-offs in deciding which broadband technology (or technologies) to deploy within their service area. Wireless broadband offers mobility, and depending on the topographic features of the service territory, fairly broad geographic coverage.[15] On the other hand, wireless broadband suffers from capacity constraints, security and reliability challenges,

---

12 Utopian Comments at p. 2; WCA Comments at p. 21.

13 Clearwire Comments at p. 1.

14 Windstream Comments at p. 11.

15 *See, e.g.,* TIA Comments at p. 17; Utopian Wireless Comments at p. 2; Alcatel-Lucent Comments at pp. 5-6; Motorola Comments at p. 21; Ericsson Comments at p. 8.

relatively slower speeds, and the complexity of having to manage shared last-mile access.[16]

Satellite broadband service offers relatively ubiquitous coverage (at least in the Continental United States), while eliminating the need for "middle mile" connections. Thus, satellite broadband may be well-suited for particularly remote locations.[17] On the other hand, there are speed and capacity constraints because the bandwidth is shared among customers. In addition, particularly for geostationary satellite systems, the round trip delay over the 22,000 mile trip between the Earth and the satellite creates significant latency problems.[18] Although low-Earth orbit satellites exhibit less delay, they tend to be much more capacity constrained due to the lesser amount of spectrum allocated to mobile satellite services.

Wireline broadband services are offered today using different last-mile technologies. Fiber-to-the-home offers very high speeds, although deployment costs in "brownfield" areas can be relatively expensive. Broadband service over cable facilities offers relatively high potential speeds, although sharing of the last-mile capacity means

---

[16] Verizon Comments at p. 105.

[17] Spacenet Comments at p. 2.

[18] ADTRAN has previously filed an *ex parte* submission detailing the adverse impact of latency on the customers' broadband experience in the Commission proceeding concerning input to the National Telecommunications and Information Administration and Rural Utilities Service stimulus proceeding . ADTRAN Ex Parte Submission in Docket 09-40, filed April 13, 2009 at Appendix 1. While speed is important, the latency associated with the network connection is equally important, and in many cases more so, for interactive applications requiring response times that should be perceived by the user as instantaneous. Even for non-real time applications such as web browsing, small additions to network latency can have a multiplicative effect that results in latency, and not speed, frequently being the dominant factor in web page download times.

that customer-experienced speeds may be much slower than the peak data rates touted by the cable companies.[19]

Another wireline broadband architecture service providers can select utilizes the embedded copper loops and DSL technology. Such architectures may be very economical in "brownfield" deployments since the "last-mile" copper loops are already deployed. Historically, DSL was relatively slower than cable modem peak data rates (and much slower than fiber-to-the-home data rates), although advances in DSL technology have virtually eliminated those differentials. The length of the copper loop affects the speeds that can be achieved. Current advanced DSL technology – VDSL2 – provides speeds of 30 Mbps over copper loops of one mile. Over a shorter 2,000 foot loop, speeds of 60 Mbps are possible presently. Moreover, through the use of newer techniques such as pair-bonding and vectoring, data rates in excess of 90 Mbps are possible on one-mile loops.[20] Thus, a service provider may be able to economically deploy very high speed broadband services rivaling fiber-to-the-home data rates using advanced VDSL2 technology by extending fiber to remote terminals or nodes, thereby shortening the length

---

[19] ADTRAN submitted a White Paper to the Commission in Docket 09-40 that sought to develop a metric to gauge the difference between the sustainable and peak data rates. While development of a more precise formula will require additional refinement, as a general proposition ADTRAN was able to conclude that the difference is much greater for architectures that use a shared channel in the last-mile than for architectures with dedicated resources in the last-mile. *See* ADTRAN *Ex Parte* Submission in Docket 09-40, filed April 13, 2009, "Defining Broadband Speeds – an Analysis of Peak vs. Sustained Data Rates in Network Access Architectures."

[20] *See* ADTRAN *Ex Parte* Submission in Docket 09-51, filed June 23, 2009, Presentation by Dr. Kevin Schneider, "Wireline Broadband Access."

of the embedded copper loops.[21] Service providers recognize this, and have deployed advanced DSL technologies to bring faster broadband to their customers.[22]

The Fiber-to-the-Home Council asserted in its initial comments that fiber-to-the-home is the only network architecture that can meet the peak expected consumer demand for the next decade.[23] ADTRAN agrees that fiber-to-the-home is ideal for high capacity bandwidth and performance, and will become critically important when speeds of Gigabits per second for each subscriber are needed. On the other hand, ADTRAN notes that there are other technologies that may better fit a number of deployment topologies from a cost/performance perspective. As explained above, very high data rates are available using DSL technologies today, and those speeds are increasing. Indeed, ADTRAN examined the issue of various broadband access architectures' ability to provide the required capacity projected through the year 2015 (derived from Cisco's Visual Networking Index), and found that DSL networks designed to Carrier Serving Area guidelines will exceed the projected requirements for the year 2015.[24]

---

[21] *See, e.g.,* Windstream Comments at p. 8 (shortening the copper loops by deploying fiber deeper into the network is a particularly cost-effective way to reach customers who lack access to core broadband applications). *See also TMC*, "IPTV Over Copper: A Valid Business Proposition?" (July 15, 2009) (http://iptv.tmcnet.com/topics/iptv/articles/59920-iptv-over-copper-valid-business-proposition.htm) (fiber-to-the-node can be very economical in brownfield deployments).

[22] *E.g.,* Windstream Comments at p. 9 (currently provides 12 Mbps downstream to one-third of its customers using DSL technology).

[23] Fiber-to-the-Home Council Comments at n. 49.

[24] *See* ADTRAN *Ex Parte* Submission in Docket 09-51, filed June 23, 2009, "Defining Broadband Speed: An Analysis of Required Capacity in Network Access Architectures."

As the discussion above demonstrates, broadband service providers can choose from many different technologies and architectures. In doing so, they will be analyzing the economics of their specific territory (including previous investments they have made), and responding to consumer demands.[25] In addition, service providers' decisions may be impacted by government subsidies (in the form of grants, loans, tax incentives and/or universal service subsidies), which in turn will presumably be tied to the provision of "broadband." In order for the market (and any subsidies) to work effectively, there needs to be a common understanding of what consumers are getting.

In the Notice of Inquiry, the Commission asked whether broadband should be defined in terms of particular data rates or a customer "experiential" metric.[26] ADTRAN agrees with the commenting parties that support an "experiential" approach to defining broadband.[27] A simple reliance on "speed" fails to capture other important aspects of broadband service that significantly affect the customers' experience. As Cisco observed, in developing the National Broadband Plan the Commission should certainly aim high with regard to speed, but any measure of broadband should also consider the quality of the user experience, which will be affected by factors such as latency and jitter.[28] Similarly, Intel observed that in assessing broadband service metrics beyond speed are

---

[25] *See* Verizon Comments at pp. 26-27 (consumers should be able to choose which features, such as speed or mobility, are important to them).

[26] *NOI* at ¶ 17.

[27] *E.g.*, USTelecom Comments at p. 9 (look to experiential approach to measure "broadband"). *Cf.*, Telcordia at pp. 6-8 (user experience, rather than simply bits per second, is more meaningful way to define broadband).

[28] Cisco Comments at pp. 10-11.

necessary, including round-trip-delay.[29] Likewise, AT&T noted that latency is an important factor – it is not just speed.[30]

Moreover, with respect to speed itself, there needs to be a way that consumers can make a meaningful comparison based on the speed subscribers will actually experience.[31] For example, in cases where last-mile capacity is shared (such as wireless or cable modem broadband services), theoretical maximum speeds -- assuming no other customers are sharing the capacity -- are not realistic or meaningful. Along the same lines, where wireless broadband speeds depend on the distance between the subscriber and the wireless tower, a speed that is achievable only when directly adjacent to the tower is not realistic or meaningful.

The comments in this proceeding are replete with such unrealistic measures of speed. In describing the data rates various technologies can support, commenting parties used terms such as "maximum speed" (Ericsson Comments at p. 10); "peak speeds" (Qualcomm Comments at p. 11); "theoretical peak speed" (WCA Comments at n. 23); and "up to" (Motorola Comments at p. 5).[32] The recently issued Notice of Funds Availability issued by RUS and NTIA refers to "advertised speeds," but does not define that term.[33]

---

29 Intel Comments at p. 5.

30 AT&T Comments at p. 20.

31 *E.g.,* Verizon Comments at p. 43.

32 In contrast, in its comments Clearwire referred to "average actual speed." Clearwire Comments at p. 5.

33 *Broadband Initiatives Program and Broadband Technology Opportunities Program Notice of Funds Availability*, 74 Federal Register 33103 (July 9, 2009) at pp.

In order for consumers to make meaningful comparisons amongst the different broadband services, there needs to be a common metric that will allow "apples-to-apples" comparisons. In an analogous situation, the Environmental Protection Agency developed a common means of measuring miles per gallon that allows customers to readily compare different automobiles' gasoline consumption, and the National Highway Traffic Safety Administration developed a means of comparing the crash worthiness of different cars. ADTRAN urges the Commission to adopt a similar, common metric in this proceeding as part of the National Broadband Plan.

In developing such a metric, ADTRAN proposes that the definition of "speed" consider the pro-rated speed available to each subscriber household – that is, the overall peak speed delivered to the entire pool of subscribers divided by the number of subscribers – in addition to (or in place of) the "advertised speed." While the pro-rated speed is less than the speed that each household will typically experience (since not all subscribers are usually trying to access the network at the same time), it can be directly compared to the estimated loads that households place on access networks to provide a metric that would predict the networks' ability to carry those loads.[34] ADTRAN has

---

33108-09, 33120, 33123, 33125, 33129 and 33131. Indeed, not only is the term undefined in the NOFA, but ADTRAN has been unable to find any definition of or standards for determining "advertised speed" by the Federal Communications Commission or the Federal Trade Commission. *Cf.*, Cisco Comments at pp. 10-11 (look at actual, not advertised throughput).

[34] Alternatively, it would be possible to develop a common measure of "speed" based on a sustainable data rate, that is, a rate that will be experienced by individual subscribers with a prescribed probability (such as 95% or 99%) even during times of heavy usage. Such an approach would presumably be more precise, but would also be more complicated because the "sustainable data rate" would need to be calculated using agreed upon, transparent algorithms and parameters.

previously submitted a White Paper which estimates the per-household capacities that will be required in broadband access networks over the next several years,[35] and which provides guidance in estimating pro-rated household capacities for different network architectures. Combining a more consistent measure of speed with other factors affecting quality, such as latency and jitter, will ensure that customers can make informed choices. This will allow broadband in this country to be dictated by consumer choice rather than regulatory fiat.

IV. **Conclusion**

ADTRAN fully supports the Commission's efforts to develop a National Broadband Plan. The record to date demonstrates that technology exists to make broadband ubiquitous and affordable. The choice of which technology to deploy, however, should not be driven by a regulator's preconceived notion of what he or she thinks is best, but must instead be driven by informed consumer demand. The end-user experience is the most important measure that truly matters in the definition and delivery of a National Broadband Plan. The Commission should set the bar high, and let technology innovators and service providers develop and deploy

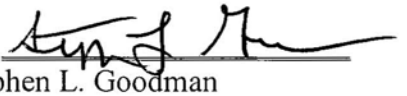
---

[35] *See* ADTRAN *Ex Parte* Submission in Docket 09-51, filed June 23, 2009, "Defining Broadband Speed: An Analysis of Required Capacity in Network Access Architectures."

solutions from a full "tool box" that best suits the serving area topology. ADTRAN believes that such a policy will best serve the public interest.

Respectfully submitted,

ADTRAN, Inc.

By: 

Stephen L. Goodman
Butzel Long Tighe Patton, PLLC
1747 Pennsylvania Ave, NW
Suite 300
Washington, DC 20006
(202) 454-2851
SGoodman@butzeltp.com

Dated: July 21, 2009