Before the
Federal Communications Commission
Washington, DC 20554

In the Matter of	)	
	)	
International Comparison and Consumer Survey Requirements in the Broadband Data Improvement Act	)	GN Docket No. 09-47
	)	
A National Broadband Plan for Our Future	)	GN Docket No. 09-51
	)	
Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion	)	GN Docket No. 09-137

COMMENTS – NBP PUBLIC NOTICE # 11

COMMENTS OF VERIZON AND VERIZON WIRELESS ON IMPACT OF MIDDLE- AND SECOND-MILE ACCESS ON BROADBAND AVAILABILITY AND DEPLOYMENT

Michael Glover
Of Counsel

Edward Shakin
Christopher M. Miller
VERIZON
1320 North Courthouse Road
9th Floor
Arlington, Virginia 22201
(703) 351-3060

John T. Scott, III
William D. Wallace
VERIZON WIRELESS
1300 I Street, NW
Suite 400 West
Washington, DC 20005

Evan T. Leo
Kellogg, Huber, Hansen, Todd, Evans & Figel, P.L.L.C.
1615 M Street, NW, Suite 400
Washington, DC 20036
(202) 326-7930

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I. INTRODUCTION AND SUMMARY

Extending the benefit of broadband services to all Americans is one of the Commission's fundamental priorities, and one that Verizon fully supports. Broadband spurs innovation and economic growth; facilitates citizens' engagement with their communities and government officials; and will help to address critical social challenges like healthcare, education, and energy efficiency. Just as important, broadband availability will create good quality jobs and increase the competitiveness of each of the communities that broadband reaches.

As a result, it makes sense to focus on the "middle mile" and "second mile" challenges in areas that do not have the benefit of broadband today. There is no question that in order to connect some rural areas to the Internet, providers must deploy these middle-mile and/or second-mile facilities over considerable distances at significant cost. These challenges are further compounded by the fact that these areas do not have the population density necessary to generate the type of demand that generally justifies the large investment needed to build these facilities. Due to the combination of these factors, the availability or cost of middle-mile and/or second-mile facilities may "play an important if not gating role in the economics of broadband deployment" in these areas. Public Notice[1] at 1.

These are the challenges. Here are some solutions:

First, the Commission should subsidize directly part of the cost of deploying and operating middle- and second-mile facilities in some rural areas with universal service

[1] FCC Public Notice, *Comment Sought on Impact of Middle and Second Mile Access on Broadband Availability and Deployment*, NBP Public Notice #11, GN Docket Nos. 09-47, 09-51 & 09-137, DA 09-2186, at 1 (rel. Oct. 8, 2009) ("Public Notice").

funds. As Verizon[2] has previously proposed, the Commission should use project-based grants and/or adopt a program that targets support to broadband providers serving those geographic areas (and only those areas) where the economics of middle-mile and/or second-mile facilities pose a barrier to broadband deployment, based on objective and verifiable criteria. The level of support should be based on factors that drive the costs of deploying middle-mile and second-mile facilities, such as low density and long distances. The Commission should limit the size of the fund to provide stability and predictability to the program. The support program should also be temporary, such as an initial term of three years, because the need for such support is likely to decline over time as broadband deployment becomes more economical. Finally, this program should be part of a comprehensive reform of the high-cost universal service fund, which should include an overall cap on high-cost support and competitive bidding for wireless support.

Second, the Commission should adopt a low, uniform rate for all broadband pole attachments so that broadband providers can deploy facilities to rural areas at a reasonable price.

Third, the Commission should prohibit unreasonable fees or other terms that prevent or delay access to public right-of-ways, and should also outlaw other state and local permits that have the effect of impeding greater broadband deployment.

This three-part approach is tailored to address the economic issue at hand: how to bring broadband to those Americans who still do not have access. Determining how to

[2] In addition to Verizon Wireless, the Verizon companies participating in this filing ("Verizon") are the regulated, wholly owned subsidiaries of Verizon Communications Inc.

serve Americans lacking access to broadband is separate and distinct from the market dynamics at play in the broader context for special access services, in which there are pockets of concentrated demand, at least one provider serving that demand, and multiple competitors also seeking to serve that demand. The distances at issue in unserved or underserved areas are much longer than typical special access connections and the problem in those areas is that there is dispersed demand (not concentrated demand) without even a single broadband provider willing or able to deploy or upgrade facilities to serve it. Thus, the regulatory issue here has nothing to do with the relative capabilities of incumbents and competitors, but instead is about ensuring that there is a single provider – regardless of whether it is an incumbent or competitor – that is able to make broadband services available to consumers.

Moreover, this approach recognizes that in areas of the country where most Americans live, extensive middle-mile and second-mile facilities have already been deployed and these facilities currently support multiple wireline and wireless broadband networks. The fact that more than 90 percent of the population has access to both wireline and wireless broadband services, and that the vast majority of consumers has two or more alternatives for each type of service, demonstrates that in most locations the availability and cost of such facilities enable robust broadband deployment and competition. These areas also are continuing to attract significant private investment for facilities to support the next generation of broadband services, including wireline technologies such as fiber-to-the-premises and DOCSIS 3.0 as well as fourth generation ("4G") wireless technologies such as Long Term Evolution ("LTE"). In these areas, the market has already delivered broadband deployment, competition, and investment, and

no "solution" with respect to middle- and second-mile facilities is required. Instead, to bring broadband to Americans that still lack access to it, the Commission should develop a targeted solution designed to address those particular areas characterized by low density and long distances.

II. THE COMMISSION SHOULD SUBSIDIZE MIDDLE-MILE AND SECOND-MILE FACILITIES IN SOME RURAL AREAS AND ELIMINATE OTHER BARRIERS TO BROADBAND DEPLOYMENT

At the September open meeting, the Broadband Initiative staff attempted to quantify how many consumers in rural and low-density pockets of the country still have limited broadband alternatives. The staff estimated that approximately 10 percent of U.S. households cannot obtain access to some form of wireline broadband service.[3] Cable modem service is unavailable in approximately 8 percent of U.S. households.[4] DSL is unavailable in approximately 17 percent of U.S. households.[5] Approximately 10 percent of Americans also do not yet have access to 3G mobile broadband services at their primary place of residence.[6] There is clearly still work to be done.

As the Public Notice correctly surmises, the cost and availability of middle- and second-mile facilities – generally together with other factors – have hindered the

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[3] FCC, Broadband.gov National Broadband Plan, *September Commission Meeting*, at 34-35 (Sept. 29, 2009), http://www.fcc.gov/Daily_Releases/Daily_Business/2009/db0929/DOC-293742A1.pdf ("*FCC September 2009 Broadband Study*").

[4] Comments of the National Cable & Telecommunications Association at 10, *A National Broadband Plan for Our Future*, GN Docket No. 09-51 (FCC filed June 8, 2009).

[5] Ind. Anal. & Tech. Div., Wireline Competition Bureau, FCC, *High-Speed Services for Internet Access: Status as of June 30, 2008*, at Table 14 (July 2009).

[6] CostQuest Associates, Inc., *US Ubiquitous Mobility Study*, at 4 (Apr. 17, 2008) (submitted to CTIA).

deployment of broadband in some instances. It can be very costly to deploy fiber or microwave from a high-speed network connection point to a rural area that is dozens or hundreds of miles away. In low-density areas, this translates into high per-unit costs that, if passed on to consumers, would make broadband too expensive for most. The higher facilities costs associated with long routes must be recovered from a much smaller base of customers, making broadband uneconomic in those areas.

The best way to address this obstacle to broadband deployment is to offset part of the costs to deploy or purchase middle- and/or second-mile facilities in these areas. Although these additional funds may not be sufficient to spur broadband deployment in all cases, experience with subsidy programs indicates that it will contribute significantly to bringing broadband to many areas with limited options today. In addition, the Commission can help address middle-mile and second-mile issues by establishing a single, low rate for all broadband pole attachments and also by removing obstacles that limit access to right-of-ways.

A. The Commission Should Establish a Targeted Funding Program for Middle- and Second-Mile Facilities in Some Rural Areas

Verizon recommends that the Commission adopt the following approach to foster the deployment of broadband in unserved areas:

Project-Based Infrastructure Grants. Once projects for which American Recovery and Reinvestment Act ("ARRA") funds have already been provided are underway, the Commission should evaluate whether there are any remaining areas of the nation in which there is inadequate access to high-capacity middle- and second-mile facilities, including whether sufficient progress is being made towards upgrading cell site

connections to support 4G wireless services. To the extent that the Commission identifies gaps, the Commission could either recommend that Congress appropriate additional funds for the National Telecommunications Information Administration ("NTIA") and Rural Utilities Service ("RUS") programs established pursuant to the ARRA, or it could establish a new, temporary program within the universal service fund to provide project-based support to help offset the cost to deploy middle- and second-mile facilities, including connections to cell sites. That program should target support to rural areas in which middle-mile and second-mile facilities do not have sufficient capacity to support broadband services and where such facilities would not be deployed in the foreseeable future without support.

***Middle-Mile Support for Broadband Providers*.** Alternatively, or in addition to, project-based infrastructure support, the Commission could provide support directly to broadband providers in rural areas to help them offset a portion of the recurring cost of middle-mile facilities. Even when high-capacity services are available, there may be rural areas in which, due to long distances and low population density, the per-customer cost of middle-mile facilities may be high enough to impinge on a rural broadband provider's ability to offer service. To address cases in which the high recurring expense of middle-mile facilities limits a rural provider's ability to offer broadband service, the Commission should establish a universal service program that would partially offset that expense. Providing support directly to broadband providers in rural areas would also foster demand for the construction of facilities in areas where they do not exist today.

This middle-mile support program should have the following attributes:

First, the program should target support only to those providers in geographic areas where the cost of middle- or second-mile facilities is a barrier to broadband deployment, based on objective and verifiable criteria. As noted, the main issue with the cost of middle- and second-mile facilities in rural areas is the relatively long distance – compared to urban areas – over which such facilities must extend and the relatively small customer base over which such costs may be recovered. Funding should be provided to address this specific economic issue. It should, in particular, be targeted to offset part of the cost of connecting the broadband provider's service area to a nearby long-haul network point-of-presence ("POP") or Internet Gateway. There is no need to provide support for long-haul network transport or Internet access service "port" costs as well, which as discussed below could be considered part of the middle mile as the Public Notice defines it. *See* § III.A, *infra*. Long-haul network transport costs are incurred by rural and urban providers alike and do not present a barrier to deployment of broadband services.

With respect to distance-sensitive middle- and second-mile facilities, the Commission must ensure that funding is provided only in the geographic areas where it is truly needed. Such areas will be limited. In responding to a 2008 survey, for example, the rural telephone companies that make up NTCA did not list middle-mile expense as one of the primary barriers to further broadband deployment.[7] Thus, before creating a new universal service program to fund middle-mile and second-mile deployment, the Commission should analyze unserved or underserved areas (for example, by using Form

[7] National Telecommunications Cooperative Association, *NTCA 2008 Broadband/Internet Availability Survey Report*, at 12, Figure 5 (Oct. 2008).

477 reports or the national broadband map that NTIA is assembling pursuant to the Broadband Data Improvement Act ("BDIA")) in order to determine where the high cost of middle- and second-mile facilities likely explains the lack of broadband deployment. That analysis may show, for example, that there is generally a threshold distance (*e.g.*, 100 miles from an Internet or long-haul network POP) beyond which broadband deployment is not generally available, or that such deployment is unlikely in areas with very low population density. Once the Commission establishes such criteria for determining where the high-cost of facilities is impairing broadband deployment, it can apply those criteria in deciding whether to award applications for funding support.

Second, the Commission should open the support program to applicants regardless of the technology they propose to use or their regulatory status. Eligibility criteria should be competitively and technologically neutral, and should be available to both wireless and wireline providers. The Commission should limit funding to avoid subsidizing duplicative networks.

Third, just as it is important to limit funding to those geographic areas where the economics do not support investment in middle- and second-mile facilities, the Commission also must ensure that the level of funding provided to a broadband provider in any given area is limited to offsetting a portion of the recurring costs associated with obtaining or deploying such facilities. This approach would be competitively and technologically neutral, and it would create incentives for providers to use the most efficient transmission services and technologies.

Fourth, the middle-mile support program should be temporary, such as an initial term of three years, given that the need for such support is likely to decline over time. A

broadband provider's per-unit costs decrease significantly as the number of customers it can serve over joint-use facilities increases. Accordingly, a broadband provider's need for universal service support will be greatest when the provider is beginning to offer service and its customer base is small, and will decline as the broadband provider gains customers. Other factors also may contribute to a decline in support requirements over time, such as additional funding the provider may receive.[8] The initial three-year term of the program should provide a broadband provider with sufficient time to enter an unserved or underserved area and – with the aid of the program's support – build up its customer base to the point that declining per-unit middle-mile costs make universal service support unnecessary.

Finally, the Commission should impose several requirements on support recipients further to ensure that middle-mile support is being used for its intended purpose. For example, the Commission should adopt certification requirements under which recipients would be required to certify on an annual basis that they are using middle-mile support only for the intended purpose.[9] The Commission should further require support recipients to file semiannual subscriber count reports for the supported area, using the same "speed tiers" that are used for Form 477 reporting. Subscriber count reporting will assist the Commission in verifying that support recipients are using middle-

[8] For example, the RUS Broadband Initiatives Program ("BIP") and NTIA Broadband Technology Opportunities Program ("BTOP") middle mile projects supported by ARRA funds will provide additional middle mile transport options that may shorten middle mile transport routes.

[9] Existing universal service programs require similar certifications. *See, e.g.,* 47 C.F.R. § 54.313(b).

mile support for the purpose for which it is intended, and will also allow the Commission to evaluate the effectiveness of its middle-mile support program.

High-Cost Fund Reform. Critically, any new funding program for middle-mile or second-mile facilities should be part of comprehensive reform of the high-cost fund, including an overall cap on high-cost support and competitive bidding for wireless support. As Verizon has previously explained, capping the high-cost fund is necessary because unrestrained growth in the fund imperils both the affordability and the sustainability of the Commission's universal service programs. The USF contribution factor reached an all-time high of 12.9 percent in the third quarter of 2009, and is likely to increase to at least 14.2 percent next quarter and perhaps even further as the contribution base declines.[10]

The Commission also should set a specific budget (which should be established once, and not every year) for this new support program that targets funding to middle- and second-mile facilities. Establishing a budget will help ensure that such funding is used efficiently. For example, under the current USF system funding can be used inefficiently by distributing universal service support to multiple carriers within a single study area.[11] Granting funds to more than one entity per area makes no economic sense. In areas where the economics do not support even a single provider, the Commission's

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[10] *See* USAC, *Federal Universal Service Support Mechanisms Quarterly Contribution Base for the Fourth Quarter 2009*, at 7 (Sept. 1, 2009); USAC, *Federal Universal Service Support Mechanisms Quarterly Contribution Base for the Third Quarter 2009*, at 7 (June 1, 2009).

[11] *See* Comments of Verizon and Verizon Wireless at 26-27, *Federal-State Joint Board on Universal Service; High Cost Universal Service Support*, CC Docket No. 96-45, WC Docket No. 05-337 (FCC filed May 8, 2009).

goal should be to ensure that consumers in those areas will always have at least one broadband provider, not to create competition where it is not otherwise possible. This is best accomplished by directing funds to a single provider.

B. The Commission Should Establish a Single, Low Rate for All Broadband Pole Attachments and Address Right-of-Way Issues

In addition to the targeted support program, there are other steps the Commission should take to foster middle- and second-mile deployment in unserved areas.

First, the Commission should establish competitive and regulatory parity with respect to the rates that are charged to various providers of broadband services for pole attachments (including conduit)[12] by such providers. As Verizon has explained elsewhere, under the current system, ILECs are often forced to pay pole attachment rates that are at least two-to-three times higher than the rates that other carriers and cable television systems pay for the same attachments.[13] This system is neither rational nor sustainable in today's environment, where these various providers compete head-to-head to provide broadband services, and either have expanded or are expanding into one another's core businesses (cable into telephony and vice versa). Moreover, since rural ILECs are likely to play an important role in delivering broadband to unserved areas, fixing this broken system will help promote broadband deployment in these areas. The Commission should accordingly exercise its express statutory authority to establish a

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[12] Under Section 224 of the Communications Act of 1934, the Commission has jurisdiction over pole attachments and conduit.

[13] *See* Comments of Verizon in Response to Notice of Proposed Rulemaking, *Implementation of Section 224 of the Act; Amendment of the Commission's Rules and Policies Governing Pole Attachments*, WC Docket No. 07-245, RM-11293 & RM-11303 (FCC filed Mar. 7, 2008).

uniform rate formula for all pole attachments by all providers of telecommunications services and cable television systems that offer broadband services.

Second, the Commission should use its authority under 47 U.S.C. § 253 to prohibit right-of-way fees that are unreasonable or discriminatory. As the Commission staff recently found, the cost of obtaining access to public right-of-ways – including lengthy administrative delays as well as "highly variable" and excessive fees – "may have a significant impact on fiber deployment."[14] A case in point involves the demands that the New York State Thruway Authority ("NYSTA") made to Williams Communications, Inc. After Williams invested more than $31 million to build a backbone facility along the Thruway, NYSTA demanded that it pay millions of dollars in additional fees in order to make connections necessary to use that backbone. Verizon has experienced similar unreasonable practices and excessive fees, as it has set forth previously.[15] The Commission has previously construed Section 253 to preempt local action that "materially inhibits or limits the ability of any competitor or potential competitor to compete in a fair and balanced legal and regulatory environment."[16] The

[14] *FCC September 2009 Broadband Study* at 50.

[15] *See* Comments of Verizon and Verizon Wireless, *Petition for Declaratory Ruling That Certain Right-of-Way Rents Imposed by the New York State Thruway Authority Are Preempted Under Section 253*, WC Docket No. 09-153 (FCC filed Oct. 15, 2009).

[16] *California Payphone Association Petition for Preemption of Ordinance No. 576 NS of the City of Huntington Park, California Pursuant to Section 253(d) of the Communications Act of 1934*, Memorandum Opinion and Order, 12 FCC Rcd 14191, ¶ 31 (1997).

Commission should now apply that standard to right-of-way fees, which will help promote broadband deployment.[17]

III. EXTENSIVE MIDDLE-MILE AND SECOND-MILE FACILITIES HAVE BEEN DEPLOYED IN MOST AREAS AND SUPPORT MULTIPLE COMPETITIVE BROADBAND ALTERNATIVES

Although the Commission should act immediately to foster the deployment of middle- and second-mile facilities in limited rural areas, there is no problem to address in most of the country. In the concentrated areas where most Americans live, extensive middle-mile and second-mile facilities have been deployed to support multiple wireline and wireless broadband alternatives. The extensive deployment of these broadband services demonstrates that in most locations of the country, the availability and cost of middle- and second-mile facilities support extensive broadband deployment and competition.

A. Providers of Middle-Mile and Second-Mile Facilities

There is a wide array of providers of middle-mile and second-mile facilities. As an initial matter, many broadband providers – including incumbent LECs, cable companies, and wireless carriers – are self-providing all or part of their second-mile and middle-mile requirements using their own fiber networks, fixed microwave, or other wireless technologies. Alternatively, broadband providers may obtain fiber facilities or transmission services from a large number of providers, including cable companies, fixed

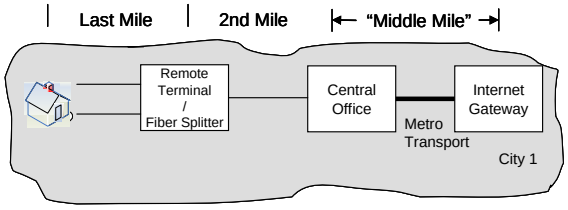
[17] Restrictions on wireless tower siting are an additional access issue that the Commission should address. As Verizon has explained, the Commission should take steps to expedite tower siting, for example, by placing reasonable time limits on state and local authority zoning decisions, and by clarifying that zoning ordinances that may have the effect of prohibiting wireless services violate Section 253(a) of the Act. *See* Comments of Verizon and Verizon Wireless on a National Broadband Plan at 5, *A National Broadband Plan for Our Future*, GN Docket No. 09-51, at 63-68 (FCC filed June 8, 2009).

wireless providers, competitive LECs, utility companies, regional fiber providers, national long-haul network operators, and incumbent LECs.

Middle Mile. The Public Notice defines the "middle mile" as the link between the central office, cable headend, or wireless mobile switching center ("MSC"), and an "Internet Gateway." In some cases, the Public Notice's definition of "middle mile" may cover a short link provided by a single provider of facilities or transmission services. In other cases, this definition may cover a circuit that is hundreds of miles long and traverses the facilities of multiple providers. In the vast majority of cases, however, broadband providers can choose from multiple competitive options for middle-mile facilities.

A broadband provider serving a city that has an Internet Gateway may require only a few miles of transport from its central office, cable headend, or MSC to the Gateway. *See* Figure 1. The broadband provider could self-provide that link, or it could obtain transmission service from a cable company, fixed wireless provider, competitive LEC, utility company, or incumbent LEC.

Figure 1. Central Office and Internet Gateway in Same City
Public Notice "Middle Mile" – Urban Central Office

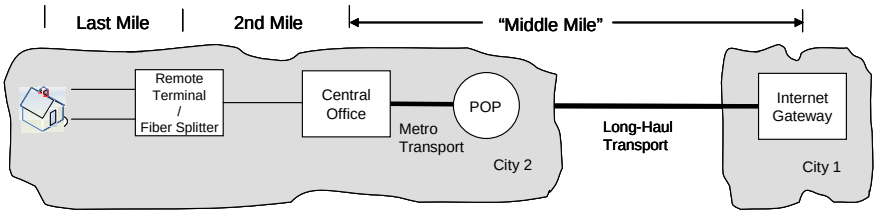


If the broadband provider is serving a city that does not have an Internet Gateway, but is served by a long-haul network operator that has deployed a POP in that city, then

the "middle mile" as it is defined by the Public Notice would include both the connection to the POP and transport over the long-haul network to the Internet Gateway. *See* Figure 2. There are multiple national long-haul network operators that provide connections to long-haul POPs in virtually all cities and larger towns throughout the nation. Those providers include Verizon, AT&T, Sprint, Qwest, Global Crossing, Level 3, and XO. Moreover, as noted above, long-haul costs are not unique to rural broadband providers, but are instead borne equally by urban and rural broadband providers alike.

Figure 2. Long-Haul Transport to Gateway City

Public Notice "Middle Mile" – Urban Central Office



IP: Interconnection Point
POP: Point of Presence

If the central office, headend, or MSC is in a rural area or is in a smaller city or town that does not have a long-haul network POP or Internet Gateway, then the "middle mile" as defined by the Public Notice would also include facilities connecting to a city with a Gateway or a long-haul POP. *See* Figures 3 & 4. Regional network operators have constructed networks that link larger cities to smaller cities and towns. Some of these network operators focus on providing services within a single state, while others, such as 360 Networks, have built networks that span several states.

Figure 3. Regional Transport to Internet Gateway City
Public Notice "Middle Mile" – Rural LEC Central Office

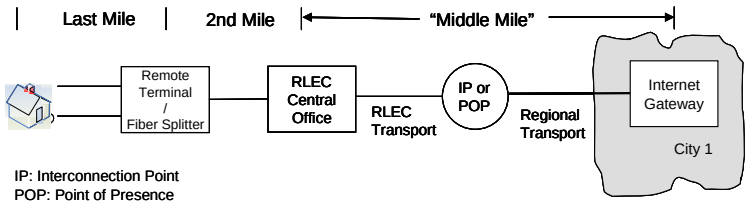
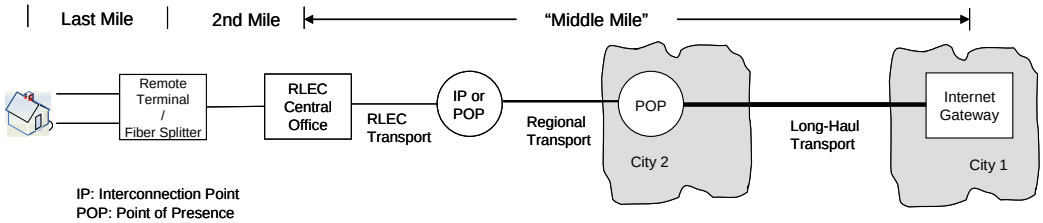


Figure 4. Regional & Long-Haul Transport to Internet Gateway City
Public Notice "Middle Mile" – Rural LEC Central Office



In some states, rural incumbent LECs have formed consortia to deploy regional networks, to spread the costs of such facilities over a larger base and make them more economic.[18] Statewide fiber networks owned by rural LECs or consortia of rural LECs now operate in at least 20 states.[19] Indatel is an alliance of more than 20 "wholesale

[18] *See Second 706 Report* ¶ 24.

[19] These states are: Idaho (Syringa Networks); Montana (Vision Net); Utah (Western FiberNet); North Dakota (Dakota Carrier Network); South Dakota (South Dakota Network); Wyoming (ACT); Minnesota (Aurora Fiber Networks and Enventis); Iowa (Iowa Network Services); Missouri (Missouri Network Alliance); Oklahoma (MBO); Texas (Texas Lone Star Network); Wisconsin (Wisconsin Independent Network); Michigan (Great Lakes Comnet and Peninsula Fiber Network); Illinois (Illinois Network Alliance); Indiana (Indiana Fiber Network); Ohio (Broadband Network Group); Tennessee (Iris Networks); Georgia (US Carrier); South Carolina (PalmettoNet); and New York (Independent Optical Network). *See* Indatel Group, *Member Map*, http://www.indatelgroup.org/MemberMap.html.

carriers" that "provid[e] fiber connectivity to rural America."[20] These fiber networks provide high-capacity transmission services to rural areas,[21] linking rural areas to each other and also to long-haul network points of presence and Internet hubs in urban areas.[22] Notably, the 20 states with rural LEC-operated statewide networks include many large midwestern and western states whose middle-mile routes are among the longest in the nation. In addition to the rural LEC consortia, regional network operators include Zayo Bandwidth, US Signal, and KDL. Incumbent LECs also can provide such regional transmission services. And further expansion of regional networks will follow the award of grants and loans pursuant to the American Recovery and Reinvestment Act of 2009 ("ARRA"); applicants in many states are seeking NTIA and RUS grants for regional "middle mile" projects.[23]

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[20] Indatel Group, *Welcome to Indatel Group*, http://www.indatelgroup.org/. A fiber network map of Indatel members can be found at: http://www.indatelgroup.org/NetworkMappage.html.

[21] Wisconsin Independent Network advertises that it "has added over 2500 miles of fiber network, building nine SONET OC-48 rings and adding fifty new points of presence, many in rural Wisconsin." Wisconsin Independent Network also states that it offers "private line services at T1, DS3, OC-n and Ethernet rates, in addition to wavelength services throughout Wisconsin and eastern Minnesota, and northern Illinois." Wisconsin Independent Network, *About Us*, http://www.wins.net/aboutus/welcome/index.html.

[22] Utah's Western FiberNet, for example, advertises that it has "established a centralized Point-of-Presence in Salt Lake City ('SLC') and many of the world's largest telecommunications carriers have established their own interconnection presence at the SLC hub and now give [Western FiberNet] the ability to offer a full range of 'big pipe' data services, including carrier-level Internet and Internet II connections." *See* http://www.westernfiber.net/about.php.

[23] For example, South Dakota Network is seeking support to "upgrade its middle mile network to enable delivery of 10 Megabit service to all end users"; Peninsula Fiber Network is seeking support to "[i]nstall fiber optic cable to unserved and underserved areas in Upper Peninsula" of Michigan; United Utilities Inc. is seeking support to "provide middle mile connectivity to 65 communities in southwestern Alaska . . . over a

Because the Commission's definition of middle mile can cover the entire path from a rural LEC central office to an Internet Gateway in a major city, the "middle mile" can encompass multiple providers' facilities. A rural LEC's broadband traffic may ride over the rural LEC's own transmission facilities to a regional fiber network's point of presence, then over the regional fiber provider's network to a long-haul provider's point of presence in a larger town or city, and then over the long-haul network provider's network to an Internet Gateway in a different city.

Second Mile. For wireline broadband providers, the facilities defined by the Public Notice as "second mile" are relatively limited in scope, covering only the link from a LEC remote terminal or fiber splitter to a central office or from a cable node or fiber splitter to a cable headend. As discussed in more detail below, LECs and cable companies typically self-provision the second mile segment.

For wireless broadband providers, the Public Notice defines the "second mile" as the link between a "base transceiver station," *i.e.*, cell site, and the MSC.[24] In some cases, wireless carriers self-provision this second mile, or part of it, using fixed microwave. Alternatively, as discussed in more detail below, wireless carriers can obtain second-mile

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combination of undersea fiber, terrestrial fiber, and microwave links." *See* NTIA, *Broadband USA: Search Applications*, http://www.ntia.doc.gov/broadbandgrants/applications/results.htm.

[24] Because an MSC may serve a large geographic area, the Public Notice's definition of "second mile" may cover a longer circuit for wireless carriers than it does for many wireline carriers. In fact, the Public Notice's definition of second mile for wireless carriers may encompass transport services and facilities that fall within the definition of "middle mile" for a wireline broadband provider. If, for example, an incumbent LEC provides a wireless broadband provider with wholesale "second mile" transport from a cell site to the wireless carrier's MSC, that circuit may include transport between LEC central offices. Under the Public Notice's definition, such interoffice transport would be considered part of the "middle mile" if used in the provision of LEC broadband services.

facilities or transmission services in the areas where demand is most concentrated from an array of competing providers, including cable companies, fixed wireless providers, competitive LECs, and incumbent LECs.

B. Middle Mile and Second Mile for Wireline Broadband

***Cable*.** Cable operators have supplied the middle mile and second mile in their cable modem networks using a combination of self-provisioning and facilities obtained from third parties. Cable operators have generally self-supplied the links the Public Notice classifies as the second mile. Since the 1990s, cable operators have invested more than $145 billion to upgrade their networks to a hybrid-fiber coaxial architecture in which fiber runs from a cable headend to a neighborhood node that typically serves anywhere from a few dozen to a few hundred homes.[25] Cable operators also have indicated that they have deployed extensive fiber facilities between their headends and Internet Gateways, links that the Public Notice classifies as the middle mile.[26] In addition, various third parties (such as Level 3 and Zayo) also provide these middle-mile

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[25] *See, e.g.*, Comments of the National Cable & Telecommunications Association at 1, *A National Broadband Plan for Our Future*, GN Docket No. 09-51 (FCC filed June 8, 2009) (the cable industry has invested "over $145 billion since 1996 to build two-way interactive networks with fiber optic technology").

[26] *See, e.g.*, Mike Robuck, *Cox Business Connects Fiber to SuperNap Data Center* (July 23, 2009), http://www.cedmagazine.com/News-Cox-Business-connects-fiber-SuperNap-data-center-072309.aspx ("Cox Business has extended its fiber network into the SuperNap colocation facility. . . . . Last week, Cox Business extended its fiber into i/o Data Centers' Phoenix One colocation facility, which has more than 530,000 square-feet of data center space."); Sean Buckley, *Can Cable Survive Without Fiber-to-the-x?*, Telecommunications Online (Feb. 18, 2009), http://www.telecommagazine.com/search/article.asp?HH_ID=AR_4857 ("[R]eports have emerged that Time Warner Cable has issued a Request for Information (RFI) for FTTP equipment options (i.e., Radio Frequency over Glass (i.e., RFoG), EPON, and 10 GigEPON). The key with these options is that they are more evolutionary in their ability to let the cable operator leverage their existing head-ends and other related equipment.").

connections for cable operators.[27] Because cable networks typically use fiber in both the middle and second mile, these facilities are capable of supporting not only current broadband services and levels of demand, but also more advanced technologies such as DOCSIS 3.0 and the increased demand that is likely to follow the adoption of these services.

The extensive availability of cable modem service and the significant investment now taking place to upgrade these services indicate that neither the availability nor cost of middle- and second-mile facilities has been a significant issue in deploying these services in most areas of the country. Cable modem service is now available to more than 92 percent of U.S. households, up from 46 percent at the start of the decade.[28] The five major cable operators – which together pass approximately 87 percent of all U.S. households – are collectively offering cable modem service to approximately 99 percent of the homes they pass.[29] Cable operators are offering broadband service extensively in

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[27] Comcast Press Release, *Comcast Extends National Fiber Infrastructure* (Dec. 7, 2004) (Announcing long-term agreement with Level 3 to provide inter-city and metro dark fiber as part of Comcast's extension of its fiber footprint: "This backbone ensures that Comcast has a technically advanced and fully upgradeable nationwide broadband network – today and in the future – over which it can deliver new and enhanced services to its customers."); Level 3, *Cable Operators*, http://www.level3.com/index.cfm?pageID=129 ("Level 3 is trusted by some of the top U.S. cable operators to help them connect to new growth possibilities. With a dedicated team of cable experts, and the powerful Level 3 Network foundation, we can help you achieve your strategies for future growth."); Zayo Bandwidth, *Zayo Bandwidth Solutions: CATV*, at 1 (2009), http://www.zayo.com/files/en/user/cms/ZB-Solutions-CATV.pdf ("Zayo provides fiber-based bandwidth services to four of the five top Cable providers in the U.S.").

[28] Comments of the National Cable & Telecommunications Association at 10, *A National Broadband Plan for Our Future*, GN Docket No. 09-51 (FCC filed June 8, 2009).

[29] *See* Comcast Corp., *Trending Schedules*, http://files.shareholder.com/downloads/CMCSA/753959014x0x313101/cef5c244-14d8-4a13-a992-b6c057c50141/trending2q09.pdf; Time Warner Cable, *Trending Schedules*,

rural areas, to approximately 15-20 million households according to the National Cable & Telecommunications Association ("NCTA").[30] And many of these rural offerings provide "speeds comparable to or better than those available in more populated areas."[31]

Until recently, most high-speed cable networks used DOCSIS 2.0 technology, which supports advertised broadband speeds that typically range from 7 Mbps to 15 Mbps downstream and from 768 kbps to 3 Mbps upstream (or higher in some cases).[32] Cable operators have recently begun upgrading their networks to DOCSIS 3.0 technology, which supports advertised downstream speeds beginning at 50 Mbps downstream or

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Reconciliations and Other Financial Information, at Schedule 3, http://files.shareholder.com/downloads/TWC/401404825x0x309454/EB92B01F-D410-4580-A6A9-A0282C3693F2/TWC_Trending_Schedules_Q2_2009_FINAL.PDF; Benjamin Swinburne et al., Morgan Stanley, *Downgrade: This Defense Not the Best Offense*, at 47, Exhibit 72, 48, Exhibit 73 & 51, Exhibit 76 (Jan. 23, 2009) (estimate of total U.S. households and year-end 2008 estimates for Cox); Charter Communications, *2Q Financial Addendum*, http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MTI1MDZ8Q2hpbGRJRD0tMXxUeXBlPTM=&t=1 (2Q09); Cablevision Press Release, *Cablevision Systems Corporation Reports Second Quarter 2009 Results* (July 30, 2009).

[30] Letter from Steven Morris, NCTA, to Marlene Dortch, FCC, GN Docket No. 09-29 (Apr. 10, 2009) ("cable operators make broadband service available to approximately 15 to 20 million rural households").

[31] *Id.* (providing examples).

[32] *See, e.g.*, John Hodulik et al., UBS, *Sorting Through the Digital Transition*, at 9 (Sept. 3, 2009); David Barden et al., Bank of America/Merrill Lynch, *Battle for the Bundle: Pressure Eases As Discounts Rolled Back*, at 16, Table 11 (Oct. 21, 2009). *See also* Comments of Free Press at Fig. 3, *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps To Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Information Act*, GN Docket No. 09-137 (FCC filed Sept. 4, 2009) (as of August 2009, offerings by providers using DOCSIS 2.0 ranged in speeds from up to 15 Mbps downstream/2 Mbps upstream to 20 Mbps downstream/1.5 Mbps upstream); Optimum Online, *Optimum Online Boost*, http://www.optimum.com/order/boost/ (Cablevision offers speeds up to 30 Mbps downstream/5 Mbps upstream).

greater.[33] DOCSIS 3.0 requires fiber in the second and middle mile, and thus the widespread deployment of these services is further confirmation that cable operators have been able to deploy or obtain fiber facilities to support their services.

For example, Cablevision has deployed DOCSIS 3.0 throughout its entire footprint, and has begun advertising 101 Mbps downstream service.[34] Comcast has already deployed DOCSIS 3.0 to 50 percent of its footprint and indicated that 80 percent of its footprint will be DOCSIS 3.0 capable by year-end 2009.[35] Cox plans to offer DOCSIS 3.0 speeds in more than two-thirds of its systems across the country by the end

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[33] *See* Cablevision News Release, *Cablevision Breaks the Century Mark – Introduces Nation's First 101-Megabits-Per-Second High-Speed Internet Service, Optimum Online Ultra* (Apr. 28, 2009); Charter Communications New Release, *Charter Internet Customers To Enjoy Faster Downloads Through PowerBoost Technology and Double Upload Speeds* (Oct. 27, 2009) (Charter's High-Speed Internet Ultra60 offers customers speeds up to 60 Mbps downstream/5 Mbps upstream); Comcast Press Release, *Comcast Rolls Out Extreme 50 Mbps High-Speed Internet Service in Washington, D.C. and Metro Area* (June 9, 2009) (Comcast's Extreme 50 offers speeds up to 50 Mbps downstream/10 Mbps upstream); Time Warner Cable, *Wideband Internet*, http://www.timewarnercable.com/nynj/learn/hso/wideband-internet/default.html (Time Warner's Wideband Internet offers customers speeds up to 50 Mbps upstream/5 mbps downstream).

[34] *See* Cablevision News Release, *Cablevision Breaks the Century Mark – Introduces Nation's First 101-Megabits-Per-Second High-Speed Internet Service, Optimum Online Ultra* (Apr. 28, 2009); Craig Moffett et al., Bernstein Research, *U.S. Telecommunications, Cable & Satellite: The Dumb Pipe Paradox, Revisited*, at 19 (June 11, 2009).

[35] *See Q2 2009 Comcast Corporation Earnings Conference Call – Final*, FD (Fair Disclosure) Wire, Transcript 080609a2285950.750 (Aug. 6, 2009) (statement by Comcast EVP & CFO Michael Angelakis); Jessica Reif Cohen, Bank of America – Merrill Lynch, *Pay TV Conference Wra*p, at 2 (Sept. 11, 2009); *Comcast Corporation at Bank of America Securities Media, Communications & Entertainment Conference – Final*, FD (Fair Disclosure) Wire, Transcript 090909a2385577.777 (Sept. 9, 2009) (statement by Comcast COO Stephen Burke).

of 2010.[36] Time Warner Cable recently deployed DOCSIS 3.0 in New York City, and states that it will continue to make DOCSIS 3.0 available in 2010.[37] Analysts estimate that, by 2013, DOCSIS 3.0 will be available to approximately 99 percent of U.S. homes passed by cable.[38]

Smaller cable companies serving rural areas have likewise begun deploying DOCSIS 3.0. For example, Sjoberg Inc., which serves 33 towns and townships in northwest Minnesota, with populations as small as 89, plans to offer DOCSIS 3.0 upgrades by the first quarter of 2010.[39] Bend Broadband, which passes 62,000 homes and businesses in central Oregon, plans to implement DOCSIS 3.0 throughout its footprint in 2009.[40]

DSL. Like cable operators, DSL providers often self-supply the network links that the Public Notice characterizes as the second mile, and in many cases also self-provision the middle-mile facilities in their networks. As discussed above, rural incumbent LECs have formed consortia to deploy middle-mile facilities, and these

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[36] Traci Patterson, *Cox Ups Internet Speeds, Boards ESPN360.com Train* (Sept. 24, 2009), http://www.cedmagazine.com/News-Cox-Internet-speeds-ESPN360-092409.aspx.

[37] Time Warner Cable News Release, *Time Warner Cable Launches Its Fastest Internet Yet in New York City with Time Warner Cable Wideband Internet & Business Class Wideband Internet* (Sept. 24, 2009); *Time Warner Cable, Inc. at Goldman Sachs Communacopia Conference New York – Final*, FD (Fair Disclosure) Wire, Transcript 091509a2435064.764 (Sept. 15, 2009) (statement by Time Warner Cable CFO & Senior EVP Rob Marcus).

[38] Todd Spangler, *Report: DOCSIS 3.0 To Blanket U.S. by 2013*, Multichannel News (May 1, 2009), http://www.multichannel.com/article/231033-Report_DOCSIS_3_0_To_Blanket_U_S_By_2013.php (citing statistics from Pike & Fischer).

[39] *See* Letter from Steven Morris, NCTA, to Marlene Dortch, FCC, GN Docket No. 09-29 (Apr. 10, 2009).

[40] *See id*.

consortia can recover the cost of such facilities over a larger base of customers and make them more economic. Some rural municipalities also have taken it upon themselves to invest in competitive facilities.

In most areas of the country, the cost and availability of middle- and second-mile facilities support deployment of high-speed DSL services. Today, DSL services are available to at least 83 percent of U.S. households nationwide,[41] at advertised speeds ranging between 768 kbps and 7.1 Mbps downstream, and between 384 kbps and 896 kbps upstream.[42] Verizon makes DSL available to approximately 25 million households in its footprint,[43] at advertised speeds ranging from 1 Mbps to 7.1 Mbps downstream and between 384 kbps and 768 kbps upstream.[44]

DSL also is available in many rural areas, although this is due at least in part to the provision of high-cost support to rural telephone companies, which has subsidized this deployment by funding joint-use voice and data facilities. The Commission's latest

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[41] Ind. Anal. & Tech. Div., Wireline Competition Bureau, FCC, *High-Speed Services for Internet Access: Status as of June 30, 2008*, at Table 14 (July 2009).

[42] *See* Verizon, *Verizon High Speed Internet: Plans*, http://www22.verizon.com/Residential/HighSpeedInternet/Plans/Plans.htm (offers downstream speeds ranging from up to 1 Mbps to 7.1 Mbps, with upstream speeds ranging from up to 384 kbps to 768 kbps); AT&T, *Compare DSL Plans – AT&T High Speed Internet Direct*, http://www.att.com/gen/general?pid=11575 (offers downstream speeds ranging from up to 768 kbps to 6.0 Mbps, with upstream speeds ranging from up to 384 kbps to 768 kbps); Qwest, *Compare Qwest High-Speed Internet Plans*, http://www.qwest.com/residential/internet/broadbandlanding/compare_plans.html (offers downstream speeds ranging from up to 1.5 Mbps to 20.0 Mbps, all with upstream speeds of up to 896 kbps).

[43] *See* Verizon News Release, *Verizon's High Speed Internet Service Now Available in Simpsonville and Woodruff, S.C., Areas* (Sept. 2, 2009).

[44] Verizon, *Verizon High Speed Internet: Plans*, http://www22.verizon.com/Residential/HighSpeedInternet/Plans/Plans.htm.

data indicate that, as of 2008, approximately 91 percent of the smallest rural LECs had upgraded their plant to provide broadband.[45] NECA notes that, according to its most recent Trends report, "overall broadband availability to customers served by its Traffic Sensitive ("TS") pool members reached 92 percent in 2008, a large increase from the 2005 average broadband availability of 79 percent."[46] Small rural LECs have received approximately 86 percent of the funding provided through USF high-cost support mechanisms, as compared to 14 percent of such funding provided to Verizon, AT&T, and Qwest combined.[47]

Fiber. Verizon and other companies also have deployed middle-mile and second-mile facilities to support the fiber-based broadband services that are now being deployed to millions of U.S. households. Although middle-mile facilities are one of the costs in a fiber-based broadband network, these costs generally do not drive the decision of whether fiber-based broadband is economic in a given location. The key cost factor is instead the cost of replacing last mile copper with fiber, which is why some companies have opted to deploy fiber to a neighborhood node ("FTTN"), rather than all the way to the customer's

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[45] *FCC September 2009 Broadband Study* at 47.

[46] Comments of the National Exchange Carrier Association at 2-3, *Report on Rural Broadband Strategy*, GN Docket No. 09-29 (FCC filed Mar. 25, 2009) (citing NECA, *Trends 2008*, at 3, 7 (2008) ("NECA, *Trends 2008*")).

[47] *FCC September 2009 Broadband Study* at 47. Approximately 97 percent of the TS pool members offer DSL, while only 38 percent were deploying fiber loops in their networks. NECA, *Trends 2008* at 7 & 18. As of 2008, TS pool members had deployed 1.3 million DSL lines and 372,000 fiber loops in their networks. NECA, *Trends 2008* at 6, 7, Table 2 (fiber loops include 152,000 FTTP/FTTH loops and 220,000 FTTC/FTTN loops).

premises or home ("FTTP" or "FTTH").[48] In the case of Verizon, by year-end 2006, our actual cost per home passed with FiOS (which would include last-mile costs as well as costs for what the Public Notice defines as the second mile) was $799, and Verizon is on track to reduce that to $700 by 2010.[49] Verizon's gross capital cost per home connected to FiOS was $842 as of year-end 2006, and Verizon is on track to reduce that to $650 by 2010.[50] Of course, these costs are average costs for the areas where Verizon is deploying FiOS and vary area by area depending on the particular circumstances – housing density, aerial versus buried plant, soil type, etc.

Despite the significant costs, Verizon and other companies are in the process of deploying fiber-based broadband services to millions of households, including middle-

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[48] *See, e.g.*, Christopher Larsen et al., Prudential Equity Group, *RBOC Fiber Deployment and Video Services Update*, at 7, 11 (Dec. 28, 2005) ("AT&T's choice to go with FTTN versus FTTP was driven by speed, but cost and invasiveness (digging streets and backyards, etc.) also aided the decision. (The biggest cost differential is trenching.). . . Because AT&T is installing fiber lines only to the node and is not upgrading all subs afterward, its deployment costs are significantly lower than Verizon's on a per subscriber basis."); Andrew Haskins et al., HSBC Global Research, *Heart of Glass: Fibre-Optic Upgrades Prove Fickle Friends*, at 12 (July 6, 2006) ("[T]he comparatively higher cost of FTTP is driven mostly by the need to lay fibre all the way to the premises, rather than just half way (ie FTTN) or indeed not at all (ie ADSL2+)"); National Telecommunications Cooperative Association, *NTCA 2007 Broadband/Internet Availability Survey Report* (Sept. 2007), http://www.usdoj.gov/atr/public/workshops/telecom2007/submissions/228008.htm#N_9_ ("Deployment cost remains the most significant barrier to wide deployment of fiber, followed by regulatory uncertainty, long loops, obtaining cost-effective equipment and low customer demand."); Congressional Research Service, *Broadband Internet Regulation and Access: Background and Issues*, at CRS-3 (Apr. 14, 2006), http://digital.library.unt.edu/govdocs/crs/data/2006/upl-meta-crs-8747/IB10045_2006Apr14.pdf ("[T]he high cost of installing optical fiber in or near users' homes has been a major barrier to the deployment of FTTH").

[49] Letter from David Young, Verizon, to Marlene Dortch, FCC, GN Docket No. 09-51, at 2 (Sept. 11, 2009).

[50] *See id.* at 3.

and second-mile facilities to support these services. These fiber-based deployments now pass over 15 million households nationwide;[51] analysts expect that total (including both FTTP/FTTH and FTTN) to reach 50 million by 2012.[52] Verizon accounts for a large share of these totals. Verizon is investing over $23 billion to pass 18 million premises with its next-generation, all-fiber FiOS network by the end of next year, and has already passed approximately 13.8 million of those premises – approximately 43 percent of households in its current landline footprint.[53]

Apart from Verizon, most FTTH deployment has occurred in rural areas, where it has been indirectly subsidized in many (if not most) cases by federal funding or has been deployed by municipalities or public utilities.[54] According to one study, there are "a total of 681 other providers of FTTH in America which represents over 1.1 million total

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[51] Letter from Thomas Cohen, Kelley Drye & Warren, LLP, Counsel for Fiber-to-the-Home Council, to Marlene Dortch, FCC, GN Docket No. 09-29, at 1 (Apr. 21, 2009). *See also* FTTH Council Press Release, *North American Fiber to the Home Connections Surge Past Five Million* (Sept. 29, 2009) (17.2 million homes passed in North America as of September 2009).

[52] *See* Craig Moffett et al., BernsteinResearch, *U.S. Telecommunications, Cable & Satellite: The Dumb Pipe Paradox, Revisited*, at 4-5, Exhibit 2 (June 11, 2009).

[53] Verizon Communications, *Q2 Investor Quarterly 2009*, at 8 (July 27, 2009), http://investor.verizon.com/financial/quarterly/vz/2Q2009/2Q09Bulletin.pdf?t=633918072029266115.

[54] *See, e.g.*, Michael Render, RVA LLC, *Overview: ILEC vs. Muni-Fiber Builds*, The FTTH Prism (Mar. 2009), http://www.chaffeefiberoptics.com/nwsltr/ ftthprismvol6no2.pdf; Letter from Larry Sevier, CEO, Rural Telephone Service Company, Inc., to Marlene Dortch, FCC, GN Docket No. 09-29 (May 14, 2009) (Rural Telephone Service Co., which serves 13,800 customers in an area of "remote western Kansas" that "consists of approximately 6,600 square miles roughly the size of Connecticut and Rhode Island" states that it is "providing broadband service to approximately 95 percent of our service area through various technologies, mainly fiber-to-the-premise (FTTP)," and that it relies on "internal equity funds, the RUS loan program and USF in order to provide affordable infrastructure.").

connections."[55] One research analyst notes that "approximately one-half of rural ILECs have already started providing FTTH to some or all of their customers, and another quarter plan to start building FTTH in the next three years. Over 12 percent of rural ILEC customers have already been passed with fiber and over 7 percent have been connected."[56] In other rural areas, however, "FTTH deployment has been slow."[57]

Some companies – most notably AT&T and Qwest – have decided to deploy FTTN rather than FTTP services.[58] AT&T states it has passed more than 19 million housing units with its U-Verse network, and has indicated that it plans to deploy the service to 30 million housing units by the end of 2011.[59] Qwest reports it has deployed FTTN service to more than two million homes, and expects to reach more than three million homes by the end of the year.[60]

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[55] RVA LLC, *Fiber-to-the-Home: North American Market Update, for the FTTH Council*, at 9-10 (Apr. 2009), http://www.ftthcouncil.org/sites/default/files/RVA.FTTH_.Apr09.060109.pdf.

[56] Michael Render, RVA LLC, *Overview: ILEC vs. Muni-Fiber Builds*, The FTTH Prism (Mar. 2009), http://www.chaffeefiberoptics.com/nwsltr/ftthprismvol6no2.pdf.

[57] *Id.*

[58] AT&T and Qwest claim to be able to offer broadband speeds of up to 18 Mbps and 40 Mbps downstream, respectively, over these networks. AT&T, *AT&T U-verse High Speed Internet*, http://www.att.com/u-verse/explore/internet-landing.jsp; Qwest Press Release, *Qwest Unveils 40 Mbps Downstream, 20 Mbps Upstream High-Speed Internet Service* (July 20, 2009).

[59] AT&T News Release, *AT&T U-verse TV Ranks Highest in J.D. Power and Associates Study in South and West Regions for Second Year in a Row* (Oct. 7, 2009); AT&T News Release, *AT&T Reports Fourth-Quarter and Full-Year Results Highlighted by Robust Wireless Data Growth, Accelerated U-verse TV Ramp, Continued Double-Digit Growth in Data Services* (Jan. 28, 2009).

[60] Qwest Press Release, *Qwest Unveils 40 Mbps Downstream, 20 Mbps Upstream High-Speed Internet Service* (July 20, 2009); Qwest, *Shareholders Meeting: Chairman's Remarks (Ed Mueller)*, at 4 (2009).

C. Middle-Mile and Second-Mile Facilities for Wireless Broadband

As is the case with wireline broadband, extensive middle-mile and second-mile facilities have been deployed to support multiple wireless broadband alternatives in areas of the country where most Americans live. Consumer demand for wireless bandwidth is growing at an extraordinary pace, however, and going forward wireless carriers will need significant additional capacity to their cell sites in order to support greater use of 3G and 4G services.[61] Many wireless carriers are accordingly in the process of upgrading the amount of bandwidth they obtain between their cell sites and mobile switching centers (so-called "wireless backhaul"), which has facilitated a widespread transition from copper to fiber and fixed-wireless technologies.[62]

As Verizon has previously demonstrated, the marketplace for wireless backhaul is competitive and growing more so, particularly in urban and suburban areas where

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[61] *See* In-Stat Press Release, *Growth in Mobile Data Triples Backhaul Capacity Demands* (Oct. 10, 2009) ("[T]he need for more backhaul capacity will grow three-fold between 2009 and 2013"); FCC, National Broadband Plan Workshop, *Deployment – Wired*, Transcript at 31 (Aug. 12, 2009) ("*FCC Wired Deployment Transcript*") (FiberNet President and COO David Armentrout: "[O]bviously more and more of the towers will require fiber backhaul"); *id.* at 45 ("T1s are out . . . it's either going to be fiber or its going to be microwave."); *see also, e.g.*, Yankee Group, Anchor Report, *The Inevitable Transformation of the Mobile Internet* at 3 (Apr. 2009) ("Backhaul networks, which in most cases continue to be based on TDM and Frame Relay technologies cannot support the massive growth in broadband traffic demands."); Visant Strategies Press Release, *Backhaul Capacity of United States Mobile Wireless Networks Will Continue To Increase Substantially, New Visant Strategies Report Finds* (Oct. 15, 2009), http://finance.yahoo.com/news/Backhaul-Capacity-of-United-bw-2311028811.html?x=0&.v=1 ("base stations with more than 24 Mbps of backhaul capacity will grow by more than a factor of twenty from 2009 to 2015 . . . wireless backhaul links will nearly double by 2015.").

[62] *See* Jennifer Pigg, Yankee Group, *Mobile Backhaul: Will the Levees Hold?*, at 6 (June 2009) ("Mobile network operators in 2009 are relying predominantly on fiber, leased T1s and microwave for their backhaul solutions. . . . The industry is yielding to the pressures of increasing mobile traffic by gradually transitioning to fiber backhaul.").

demand for high-capacity services from cell sites is most concentrated. Intermodal competitors – particularly cable operators and fixed wireless providers – have rapidly emerged to fill the demand for higher-speed wireless backhaul services.[63] Each of the major cable operators – Comcast, Time Warner Cable, Cablevision, Cox, and Charter – has invested heavily to upgrade and extend their high-capacity networks to provide wireless backhaul services.[64] And there are now more than a dozen fixed wireless

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[63] *See, e.g.*, *FCC Wired Deployment Transcript* at 35 (Dallas Clement, Cox Communications EVP and Chief Strategy and Product Officer: "Relative to wireless backhaul from cell sites . . . I'll tell you that in our commercial business it's a growth area. We're getting calls in our franchises from wireless providers who are preparing for their 4G networks and they're looking for lower cost alternatives for back haul. And because we're there and we can do sort of spurs off our network, we feel as though it's a big growth area and we're deploying capital to that area to be able to satisfy that demand."); Ravi Potharlanka, COO, FiberTower Corp., Written Testimony before the House Energy and Commerce Committee, Subcommittee on Communications, Technology, and the Internet, Hearing on Competition in the Wireless Industry, at 3, 4 (May 7, 2009), http://energycommerce.house.gov/Press_111/20090507/testimony_potharlanka.pdf (FiberTower COO Ravi Potharlanka: "We offer our services to mobile wireless carriers, competitive and local exchange carriers, 1st responder networks, and to government and enterprise customers. Our network currently covers approximately 12,000 route miles with 7,000 miles covered using fixed wireless and another 5,000 miles using dark fiber. Through our partnership and master lease agreements we have the ability to access over 100,000 towers nationwide. . . . We have customer agreements with the eight largest U.S. wireless carriers.").

[64] *See* Patrick Brogan & Evan Leo, *High-Capacity Services: Abundant, Affordable, and Evolving*, at 35-36 & Table 12 (July 2009) ("*USTelecom Report*"), *attached to* Letter from Glenn Reynolds, USTelecom, to Marlene Dortch, FCC, WC Docket No. 05-25, GN Docket No. 09-51 (July 16, 2009); *Q2 2009 Comcast Corporation Earnings Conference Call – Final*, FD (Fair Disclosure) Wire, Transcript 080609a2285950.750 (Aug. 6, 2009) (statement by Comcast Corp. COO Steve Burke: "[W]e are expanding our cell backhaul operations and now have agreements with wireless carriers contracted for over 2000 towers. Our goal is to keep this business growing rapidly and this is an area where we would like to invest as much capital that gets a good return as possible."). *See also* Comcast Corp., *3Q 2009 Results*, at 11 (Nov. 4, 2009), http://files.shareholder.com/downloads/CMCSA/753959014x0x329261/33e5a9c9-7680-

providers also offering wireless backhaul services in markets throughout the country.[65] For example, FiberTower calls itself "the nation's leading alternative carrier for middle mile and last mile backhaul" with a network that "spans more than 6,000 base stations in 13 U.S. markets," and with "access to more than 100,000 towers nationwide."[66] Fiber-based competitors such as Level 3 also offer wireless backhaul services. Level 3 states that its Wireless Tower Access Service provides "more efficient and cost-effective options for wireless backhaul in metropolitan and rural locations," and is "[p]rimarily located in rural areas."[67] Wireless carriers acknowledge that they are using all of these various competitive alternatives.[68] There also are new technologies that allow wireless

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4025-a068-a46668578fa1/3Q09%20Slide%20Faces%20-%20Final.pdf (wireless backhaul is "~$1Bn opportunity for Comcast").

[65] *See USTelecom Report* at 35-38 & Tables 11, 13.

[66] Comments of FiberTower Corporation at 3, *A National Broadband Plan for Our Future*, GN Docket No. 09-51 (FCC filed June 8, 2009).

[67] Level 3 Press Release, *Level 3 Launches Wireless Tower Access Service* (Oct. 22, 2009); *see also* Kevin Fitchard, *Verizon Lays Fiber to 1000 Cell Sites*, Telephony Online (Nov. 2, 2009), http://telephonyonline.com/3g4g/news/verizon-fiber-cell-sites-1102/ ("Level 3 is targeting rural and small town cellular networks by tapping into its in-line optical amplifiers spaced every 60 miles or so along its fiber backbone routes.").

[68] FCC, National Broadband Plan Workshop, *Wireless Broadband Deployment – General*, Transcript at 45-46 (Aug. 12, 2009) ("*FCC Wireless Broadband Deployment Transcript*") (T-Mobile Senior VP, Engineering Operations Neville Ray: "And, you know, be that fixed Ethernet delivery in one form or another over fiber, over coax, whatever it might be, you know, we are seeing economic forces at work in major metro areas where that is starting to change. So if I look at our 3G footprint today, we are certainly moving to, you know, a fiber back haul solution environment which is significantly higher than 10 percent. And I think that competitive forces work in metro areas where there's a lot of fiber, be that from the utility company, from the cable company, from the existing, you know, telco provider"); *id.* at 46 (T-Mobile Senior VP, Engineering Operations Neville Ray: "[A]s you move to suburban fringe and rural areas, those [fiber] opportunities are much tougher to find, but there are good microwave solutions, as Ed [Evans, Stelera Wireless] mentioned, and some carriers are totally deploying their back haul solutions on a microwave basis"); *FCC Wired Deployment*

carriers to obtain backhaul more economically by aggregating traffic from multiple cell sites to single aggregation points.[69]

Wireless carriers have also demonstrated the ability to self-provision backhaul, including with respect to new 4G services. Most notably, Sprint has stated that it is "proceeding aggressively with its deployment of 4G WiMax technology" through its "$7.4 billion investment in Clearwire," which "will use self-provisioned microwave backhaul to handle the high-bandwidth requirements associated with 4G applications to the maximum extent possible."[70] Clearwire claims to have "one of the largest wireless backhaul networks in the world"[71] and has told analysts that it is investing in microwave equipment so it can self-provision facilities to meet "roughly 80 percent of its [wireless]

Transcript at 30 (Allied Fiber CEO Hunter Newby: "[I]t's the combination of fiber and microwave, which for backhaul from towers that don't have much fiber can cover a much larger swath of the country along this way"); *FCC Wireless Broadband Deployment Transcript* at 47 (Verizon VP, Network and Technology Strategy Tom Sawanobori: "There are microwave solutions of significant bandwidth that will support LTE and other fourth generation technologies").

[69] *See, e.g.*, Alcatel-Lucent Press Release, *Alcatel-Lucent Solidifies Market and Technical Leadership in Mobile Backhaul* (Apr. 1, 2008) (The 9500 Microwave Packet Radio is a "cell site aggregation product [which] flexibly aggregates packet-based and Time Division Multiplexing (TDM) traffic to provide optimized bandwidth backhaul capabilities over a common transport layer"); Overture Networks Press Release, *Overture Networks Sets Capacity Standard with New Pseudowire Gateway* (Sept. 16, 2009) ("With its ability to aggregate traffic from hundreds of cell sites, the UTX8500 enables carriers to reduce costs by 50% or more when compared to previous technology alternatives.").

[70] Comments of Sprint Nextel Corporation at 5, *Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps To Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, As Amended by the Broadband Data Improvement Act*, GN Docket No. 09-137 (FCC filed Sept. 4, 2009).

[71] *Leap Wireless International at Jefferies Panel Discussion*, FD (Fair Disclosure) Wire, Transcript 090908ay.703 (Sept. 9, 2008) (statement by Clearwire Chief Strategy Officer Scott Richardson).

backhaul . . . from microwave links."[72] Clearwire also stated that it "will make its metro wireless backhaul networks available to Sprint at preferred rates, creating additional revenue opportunities for Clearwire and reducing costs for Sprint."[73] Clearwire is backed by a total of over $3 billion from Comcast, Time Warner Cable, Bright House Networks, Intel, and Google,[74] and will therefore have the ability to obtain wireless backhaul from these cable partners.

T-Mobile also has acknowledged that the company has various competitive options for wireless backhaul, including self-provisioning. The company's CTO has stated that T-Mobile is obtaining fiber from "alternate access companies," and "more promising[ly] . . . the cable industry" and also is considering "a more organic opportunity . . . to simply build high-capacity microwave."[75] T-Mobile has entered into backhaul agreements with Bright House Networks, FPL FiberNet, IP Networks, and Zayo

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[72] John Hodulik, UBS Investment Research, *Clearwire Corp.*, at 13 (Dec. 19, 2008).

[73] *Sprint Nextel/Clearwire WiMax Call – Final*, FD (Fair Disclosure) Wire, Transcript 050708a1844939.739 (May 7, 2008) (statement by Clearwire Chief Executive Ben Wolff).

[74] *See* Clearwire Corp. News Release, *Clearwire Completes Transaction with Sprint Nextel and $3.2 Billion Investment To Launch 4G Mobile Internet Company* (Dec. 1, 2008); Benjamin Swinburne et al., Morgan Stanley, *Downgrade: This Defense Not the Best Offense*, at 18 (Jan. 23, 2009) ("Comcast, Time Warner Cable, and Bright House Networks have invested $1.7B in total for roughly 12% economic ownership of Clearwire").

[75] Om Malik, *The GigaOM Interview: Cole Brodman, CTO, T-Mobile USA*, GigaOM (May 12, 2009), http://gigaom.com/2009/05/12/the-gigaom-interview-cole-brodman-cto-t-mobile-usa.

Bandwidth,[76] and also is reported to have agreements with Comcast and Sprint for 4G backhaul.[77]

The extensive deployment of wireless broadband services and the continued massive investment in these services including 4G technology, confirms that the cost and availability of middle-mile and second-mile facilities are not issues in most areas of the country. At least 90 percent of Americans now have access to 3G mobile broadband services at their primary place of residence,[78] and nearly three-quarters of consumers have a choice of multiple 3G mobile broadband carriers.[79] In 2008 and 2009 alone, wireless carriers have invested more than $40 billion to further upgrade their networks.[80]

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[76] T-Mobile Press Release, *T-Mobile Signs New Backhaul Agreements for Six Major U.S. Markets* (Sept. 18, 2008).

[77] *See* Rob Jackson, *T-Mobile 4G Network Coming with Help from Comcast,* Phandroid (June 5, 2009), http://phandroid.com/2009/06/05/t-mobile-4g-network-coming-with-help-from-comcast/.

[78] CostQuest Associates, Inc., *US Ubiquitous Mobility Study*, at 4 (Apr. 17, 2008) (submitted to CTIA).

[79] *Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services*, Thirteenth Report, 24 FCC Rcd 6185, ¶ 144, Table 9 & ¶ 146, Table 10 (2009) ("*Thirteenth CMRS Report*").

[80] *See* Comments of CTIA – The Wireless Association at 12-13, *A National Broadband Plan for Our Future*, GN Docket No. 09-51 (FCC filed Aug. 31, 2009) (U.S. wireless carriers spent $20.17 billion in capital expenditures in 2008; this investment yields "a total cumulative capital expenditure in operational systems of more than $90 billion over the last four years (not including the billions of dollars paid to the federal treasury for spectrum, or investment in pre-operational systems)"); Phil Cusick et al., Macquarie Research, *Follow the Money: 2Q Telco and Cable Capex Preview*, at 1 (July 23, 2009) ("We believe the major carriers will maintain or increase their capex budgets for 2009."); Timothy Horan et al., Oppenheimer, *Reviewing Industry Capex/FCF*, at 4, Exhibit 2 (Oct. 21, 2009) (estimating wireless capital expenditures of $22.3 billion in 2009, up from $20 billion in 2008).

In addition to Verizon and AT&T, other national, regional, and smaller wireless carriers have extensively deployed 3G services and are beginning to deploy next-generation 4G services. For example, Sprint's 3G network reaches over 270 million people,[81] and Sprint is now also in the process of an "aggressive expansion of Sprint 4G," using WiMAX technology.[82] Sprint has invested more than $7 billion in Clearwire to deploy this new 4G WiMAX network, which Sprint claims will be made available "to as many as 120 million people."[83] As noted above, Comcast, Time Warner Cable, Bright House Networks, Intel, and Google also are major investors in Clearwire, and these cable partners plan to sell Clearwire's service.[84] T-Mobile has stated that it "has invested over $7 billion thus far" to build out its 3G network, that in 2009 it "plans to double the population currently covered by its high-speed network to reach more than 200 million people in the U.S.," and that it is "also planning next-generation mobile broadband services and is actively considering advanced technologies such as 'HSPA Plus'

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[81] Sprint, *Welcome to Sprint Wireless Advantage Club*, http://www.sprint.com/landings/advantage_club/?id8=vanity:advantageclub.

[82] *See* Sprint News Release, *Sprint Continues 4G Leadership with Launch in Raleigh, Durham, Chapel Hill and Cary, N.C.* (Nov. 2, 2009).

[83] Comments of Sprint Nextel Corp. at 5, *A National Broadband Plan for Our Future*, GN Docket No. 09-51 (FCC filed Sept. 4, 2009); Comments of Sprint Nextel Corp. at 8, *Implementation of Section 6002 of the Omnibus Budget Reconciliation Act of 1993*, WT Docket No. 09-66 (FCC filed Sept. 30, 2009).

[84] *See* Frank Louthan et al., Raymond James, *Examining the Convergence of the Telecom and Cable Sectors*, at 23 (Aug. 18, 2008) ("As part of the agreement, the cable operators will sell branded wireless services under an MVNO (mobile virtual network operator) model using the Clearwire network for data). Comcast began providing 4G service in June 2009, and Time Warner Cable plans to launch 4G service on December 1, 2009. Comcast Press Release, *Comcast Begins National Rollout of High-Speed Wireless Data Service* (June 29, 2009); Time Warner Cable Press Release, *Time Warner Cable Brings 4G Wireless to North Carolina with Fastest Wireless Speeds Available* (Oct. 14, 2009).

('HSPA+') and Long Term Evolution ('LTE')."[85] Smaller wireless carriers such as U.S. Cellular, MetroPCS, Leap, Cox, and Cellular South also have deployed 3G technology, and many such as MetroPCS, Leap, U.S. Cellular, and Cox have announced plans to deploy 4G technology.[86]

Satellite broadband services also are widely available, from at least two providers, Hughes and Wild Blue (which ViaSat recently agreed to purchase for more than $565 million).[87] These satellite providers advertise "true broadband speeds" of up to 5 Mbps

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[85] Comments of T-Mobile USA, Inc. at 2, 3, *A National Broadband Plan for Our Future*, GN Docket No. 09-51 (FCC filed June 8, 2009).

[86] *See* MetroPCS Press Release, *Unlimited Wireless Carrier MetroPCS Announces Vendors for 2010 4G LTE Launch* (Sept. 15, 2009) (MetroPCS plans to deploy LTE technology in the second half of 2010); David Barden et al., Bank of America/Merrill Lynch, *2Q09 Wrap: Taking Optimism Out of the Model; PO to $28*, at 6 (Aug. 7, 2009) (Leap expects to undertake LTE trials in late 2009 and 2010); U.S. Cellular & TDS Telecom, *Presentation at the Kaufman Bros. 12th Annual Investor Conference*, at 18 (Sept. 10, 2009), http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MTUyNjh8Q2hpbGRJRD0tMXxUeXBlPTM=&t=1 (U.S. Cellular expects to conduct field trials of LTE technology in 2009 and 2010); Cox Press Release, *Cox To Launch Next Generation Bundle with Wireless in 2009* (Oct. 27, 2008) (Cox plans to test LTE technology).

[87] Other providers of satellite broadband service include: VSAT Systems, Spacenet, Skycasters, and Ground Control. *See, e.g.*, VSAT Systems, *About VSAT Systems*, http://www.vsat-systems.com/high-speed-internet/index.html ("VSAT Systems offers industrial-strength, high-speed Internet access for businesses large and small"); Spacenet, *Brochure*, http://www.spacenet.com/pdfs/about.pdf ("Spacenet Inc. is a leading provider of high-performance satellite and hybrid terrestrial broadband services for enterprise, small business and government clients."); Skycasters, *The Company*, http://www.skycasters.com/the-company.html ("Skycasters is a profitable, debt-free, privately held company that focuses on providing reliable and affordable full-time and backup broadband satellite solutions to businesses nationwide"); Ground Control Press Release, *Ground Control Systems, Inc., Awarded Oregon Satellite Contract* (Oct. 26, 2009) ("Ground Control Systems, Inc., a leading satellite internet and phone provider, has been awarded a contract from the State of Oregon to provide Satellite Services. Under the new contract, agencies will be able to access Broadband Internet where no current infrastructure is in place. . . . In the event land lines fail, the Ground Control network can serve as a primary data and voice link.").

downstream and 300 Kbps-1Mbps upstream, for their premium offerings.[88] They further recognize that "terrestrial broadband availability follows population density," whereas the economics of satellite delivery are "not impacted by population density."[89] For this reason, satellite broadband is an alternative even where other forms of broadband are not. According to Hughes, there are "[a]pproximately one million US customers being served by Hughes and WildBlue."[90] The capability of satellite broadband is expanding; whereas current generation satellites support 10 Gbps total bandwidth, next generation satellites such as Hughes' Jupiter and ViaSat-1 will support 100+ Gbps.[91]

IV. RESPONSES TO SPECIFIC QUESTIONS

As requested in the Public Notice, Verizon provides the following responses to the Commission's questions concerning the cost and availability of middle- and second-mile facilities to support broadband services.

A. Question 1: Network Components of Broadband Connectivity

The Public Notice asks how much middle- and second-mile capacity is needed to provide adequate broadband Internet access. Because not all broadband subscribers use their connections at the same time, network operators typically use traffic engineering

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[88] WildBlue/Hughes, *Satellite Broadband and the ARRA* at 3 (Mar. 23, 2009), *attached to* Letter from Stephen Baruch, Lerman Senter, Counsel for Hughes Network Systems, LLC, to Marlene Dortch, FCC, GN Docket No. 09-29 (Mar. 24, 2009).

[89] *Id.* at 4.

[90] Dean Mason, Senior VP & General Counsel, Hughes, *Satellite Broadband: Presentation to the Federal Communications Bar Association*, at 2 (Oct. 16, 2009) ("*Hughes FCBA Presentation*"). *See also* Comments of NRTC, *Rural Broadband Strategy*, GN Docket No. 09-29 (FCC filed Mar. 25, 2009) (WildBlue serves over 340,000 homes and businesses, including 82,000 served by NRTC members).

[91] *Hughes FCBA Presentation* at 5.

principles to determine peak loads of traffic for a given location, and engineer their networks to handle these peak loads. This ratio of last-mile-to-middle-or-second-mile capacity varies based on several factors, including the expected amount of peak loads in the last mile (which itself is constantly shifting), the type of traffic (*e.g.*, voice, video, or other types of data, which also is in constant flux) that must be supported, the level of end-to-end service quality that the network operator seeks to maintain, and the number of subscribers at a given location (with greater numbers, as a matter of statistical probability, generally giving network operators greater flexibility to adopt lower ratios).

While capacity requirements depend on several factors, the amount needed to support DSL in a rural central office can be approximated using the rate development assumptions for NECA's DSL tariff. In the cost support for its DSL tariff, NECA assumes that a rural LEC offering a 6 Mb/s DSL service requires 1 Mb/s of transmission capacity for every 10 DSL subscribers.[92] Using that assumption, a 44.736 Mb/s DS3 middle-mile circuit would have enough capacity to support approximately 450 DSL subscribers.

For wireless services, most of the connections between cell sites and mobile switching centers (which the Public Notice classifies as "second mile") have used TDM-based DS1 circuits. The amount of capacity that Verizon has traditionally deployed between cell sites and mobile switching centers varies widely depending on the location – in densely populated areas cell sites may contain as many as 12 DS1 circuits or more,

[92] NECA, Access Service Tariff FCC No. 5, Transmittal No. 1245, at Volume 5, Exhibit 8, Workpaper 1 of 10, Line 14 (FCC filed June 16, 2009).

while in more rural and sparsely populated the areas there may be as few as two DS1 circuits per cell site.

As Verizon Wireless and other wireless carriers deploy 4G services, existing TDM-based connections between cell sites and mobile switching centers will be insufficient to handle the rapidly rising demand for broadband wireless services. To meet this demand, Verizon Wireless and other wireless carriers have begun replacing TDM-based DS1 circuits with fiber-based Ethernet service. In initial 4G deployments, for example, a cell site may require 50 to 100 Mbps Ethernet service. In many areas of the country, multiple providers are extending fiber to cell sites in order to provide Ethernet-based second-mile connections for 4G wireless services. In some rural and low-density areas, however, the need to extend fiber to more remote cell sites imposes costs that may hinder wireless broadband deployment.

From Verizon Wireless's perspective, fiber is the preferred technology for what the Public Notice describes as second-mile (and middle-mile) facilities to support the 4G services it is deploying. Microwave is a viable second-mile alternative in most locations (as the Clearwire experience also demonstrates). As discussed further below, Verizon Wireless uses its own microwave facilities to self-provision wireless backhaul in some cases. Nonetheless, Verizon Wireless is concerned that there will not be sufficient microwave spectrum to support the needs of its 4G wireless services going forward. Free Space Optics are emerging as a viable option for second-mile transmission, although this

technology is limited to short distances and also may be susceptible to weather-induced fading.[93]

B. Question 2: Availability and Pricing of Middle- and Second-Mile Connectivity

As demonstrated in Section III.A above, there are a wide variety of middle-mile and second-mile providers. Many broadband providers – including incumbent LECs, cable companies, and wireless carriers – are self-providing all or part of their second-mile and middle-mile requirements using their own fiber networks or fixed microwave or other wireless technologies. Alternatively, broadband providers may obtain fiber facilities or transmission services from a large number of providers, including cable companies, fixed wireless providers, competitive LECs, utility companies, regional fiber providers, national long-haul network operators, and incumbent LECs. These various providers offer middle-mile and second-mile facilities and transmission services under a wide variety of names, and under a wide variety of pricing structures, making it difficult to draw any generalizations about their offerings, other than to say there is extensive competition for these services in most areas of the country.

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[93] *See, e.g.*, Jennifer Ricklin et al., *Atmospheric Channel Effects on Free-Space Laser Communication*, 3 J. Optical Fiber Communications Reports 111 (2006) ("Free-space laser communication offers an attractive alternative for transferring high-bandwidth data . . . . However, there are a variety of deleterious features of the atmospheric channel that may lead to serious signal fading, and even the complete loss of signal altogether."); Zeinab Hajjarian et al., *Analysis of Wireless Optical Communications Feasibility in Presence of Clouds Using Markov Chains*, 27 IEEE J. on Selected Areas in Communications 1 (Dec. 2009) ("In ideal free-space, the total loss due to absorption and scattering is virtually zero. . . . However, atmospheric obscurants such as; fog, haze, smoke, dust and clouds turn the propagation environment into a multiple scattering medium and hence introduce laser pulse broadening in space and time.").

Verizon Wireless's Experience as a Purchaser of Wireless Backhaul. Verizon Wireless has significant experience purchasing wireless backhaul outside of Verizon's wireline footprint to support its extensive 3G network and the 4G LTE services it is deploying. In addition, Verizon Wireless has self-provisioned some of its backhaul needs using microwave.

Going forward, Verizon Wireless will need to replace its copper cell site connections with fiber or microwave and is concerned about the availability of such facilities in some rural areas to meet its needs. At the same time, it is Verizon Wireless's experience that in the past few years the competitive options for wireless backhaul facilities in most areas have increased considerably. For example, in connection with Verizon Wireless's deployment of LTE services it has solicited bids for areas where existing facilities need to be replaced or upgraded. As part of this LTE deployment Verizon Wireless has thus far received 12 bids from cable companies, four bids from fixed wireless providers, more than 35 bids from other competitive providers, and 20 bids from ILECs. As explained further above, the increase in competitive alternatives has occurred in large part because of the rapid growth in demand for wireless services generally, and in particular for wireless broadband services, which have increased the bandwidth requirements for wireless backhaul at individual cell sites.

Verizon's Rates for High-Capacity Services. On the wireline side, Verizon provides high-capacity services to a wide variety of wholesale and retail customers, including other broadband providers and wireless carriers. As Verizon has previously explained, the vast majority of Verizon's revenue from carrier customers for DS1 and

DS3 services comes from purchases through discount plans and contract tariffs.[94] The remainder comes from purchases at standard tariff rate.

Attachment 1 contains Verizon's average revenue per unit for the DS1 and DS3 high-capacity services that Verizon sells through discount plans, contract tariffs, and standard tariffs.[95] Verizon separately tracks revenues for channel terminations and transport mileage. Revenues for transport and channel terminations are aggregated separately for urban, suburban, and rural areas.[96]

Based on the actual rates that Verizon's customers pay for transport on a per-mile basis and the rates they pay for channel terminations, for most Verizon jurisdictions rates for high-capacity services are not materially higher in rural areas than the rates in urban and suburban areas. *See* Attachment 1. This suggests that the relative price of high-capacity facilities is not what makes the cost of such facilities uneconomic in rural and other underserved areas. Rather, it is the distance such facilities must be deployed and the relatively small base of customers from which the costs of those facilities can be recovered.

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[94] *See* Supplemental Declaration of Quintin Lew ¶ 23, *attached to* Comments of Verizon, *Special Access Rates for Price Cap Local Exchange Carriers*, WC Docket No. 05-25 & RM-10593 (FCC filed Aug. 8, 2007).

[95] An ARPU-based analysis best captures what customers actually pay for services, as it reflects the discounted rates that customers actually pay. Tariff rates, on the other hand, vary significantly by term, volume, and other provisions. Tariff rates also do not easily capture discounts associated with pricing flexibility contracts.

[96] These data are for the year-to-date, as of July 2009. For purposes of classifying areas as urban, rural, and suburban, Verizon uses the following network engineering criteria: rural areas are those with fewer than 275 access lines per square mile; suburban areas are those with more than 275 and fewer than 4,800 access lines per square mile; and urban areas are those with 4,800 or more access lines per square mile.

Verizon's Tariff Discounts. The average revenues provided in Attachment 1 and discussed below reflect the discounts from standard tariffed rates that Verizon provides with respect to the vast majority of its high-capacity services. Verizon has introduced discount pricing plans (with price breaks of up to 65 percent off standard rates) and individually negotiated contract tariffs (with additional discounts up to 30 percent). Among other things, Verizon has introduced specific discount plans in response to wireless carriers' increasing demands for fiber facilities to their cell sites; Verizon's FiberConnect service offers wireless carriers discounted rates of as much as 45 percent on recurring charges. Verizon's discount programs are described in more detail in Verizon's filings in the Special Access proceeding, WC Docket No. 05-25 & RM-10593.[97]

C. Question 3: Availability and Pricing of Internet Connectivity

As discussed in Section III.A above, a broadband provider serving a city that has an Internet Gateway may require only a few miles of transport from its central office, cable headend, or Mobile Switching Center to the IP Gateway. The broadband provider could self-provide that link, or it could obtain transmission services from a cable company, fixed wireless provider, competitive LEC, utility company, or the incumbent

[97] *See, e.g.*, Letter from Donna Epps, Verizon, to Marlene Dortch, FCC, WC Docket No. 05-25, Attachment at 3-7 (Oct. 27, 2009); Reply Comments of Verizon at 11-19, *Special Access Rates for Price Cap Local Exchange Carriers*, WC Docket No. 05-25 (FCC filed Aug. 15, 2007); Comments of Verizon at 7-10, *Special Access Rates for Price Cap Local Exchange Carriers*, WC Docket No. 05-25 (FCC filed Aug. 8, 2007); Reply Comments of Verizon at 5-7, *Special Access Rates for Price Cap Local Exchange Carriers*, WC Docket No. 05-25 (FCC filed July 29, 2005); Comments of Verizon at 12-17, *Special Access Rates for Price Cap Local Exchange Carriers*, WC Docket No. 05-25 (FCC filed June 13, 2005).

LEC. Where a broadband provider is serving a city that does not have an Internet Gateway but instead is served by a long-haul network operator that has located a point-of-presence in the city, there are multiple national long-haul network operators that provide connectivity to long-haul POPs in virtually all cities and larger towns throughout the nation. Those providers include Verizon, AT&T, Sprint, Qwest, Global Crossing, Level 3, and XO.

Verizon's dedicated Internet access service – known as Internet Dedicated Service ("IDS") – can have two components: (1) an Internet "port"; and (2) transport from the customer's location to a Verizon Internet Gateway. Verizon-provided transport is not required if the customer has collocated facilities in the same carrier hotel as a Verizon Internet Gateway. Verizon refers to this service arrangement as a "port only" service.[98]

If the customer requires Verizon-provisioned transport from its location to Verizon's Internet Gateway, Verizon provisions that transport over a combination of its own facilities and transport services obtained from other providers. Because most IDS customers are concentrated in the cities in which Verizon has an Internet Gateway, the transport circuit is typically a short "metro" transport circuit. If a customer is located in a city that does not have a Verizon Internet Gateway, then the transport circuit also includes long-haul transport from the Verizon long-haul network point of presence ("POP") in the customer's city to a Verizon Internet Gateway city. As shown in Attachment 2, Verizon has long-haul POPs in many urban areas. For its IDS service,

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[98] *See* Verizon Business, *Internet Dedicated Services*, http://www.verizonbusiness.com/external/service_guide/reg/cp_internet_dedicated_services.htm.

Verizon refers to the link from the customer's location to the Verizon Internet Gateway or long-haul POP as "Network Access" or "Local Access."

Verizon's IDS offerings permit customers to select from an array of "port speeds," ranging from 128 kbps to 10 Gbps (OC-192). There is a specific price for each port speed. On a per-megabit basis, prices are lower for higher-bandwidth ports. In addition to the port bandwidth, the price of IDS depends on the contract term as well as other service features. Verizon's online service guide provides an overview of service options and general pricing information for each port speed.[99]

The Public Notice (Q.3b) asks whether the price for connecting to an Internet backbone vary from location to location. Verizon's Internet port prices are independent of customer location. Customer location does, however, affect the price of the "Network Access" component of Verizon's IDS service, *i.e.*, the transport circuit from the customer's location to a Verizon Internet Gateway or long-haul POP. Because the cost of providing that transport circuit depends in large part on the length of the circuit, the cost of the Network Access component is generally higher to serve customers in rural areas than to serve customers in urban areas.

D. Question 4: Economics of Deployment

As discussed extensively in Part III above, the economics of broadband and associated deployment of middle- and second-mile facilities support multiple competitive providers of both wireline and wireless broadband in areas of the country where most Americans live. There are, however, rural and sparsely populated pockets of the country

[99] *See id.*

in which the economics of deploying broadband and middle- and second-mile facilities remain unfavorable given the high distance-driven costs of serving those areas coupled with the relatively small number of potential customers from which those costs can be recovered.

The Public Notice (Q. 4a) first asks whether the provision of middle- or second-mile connections "to a particular location is a natural monopoly in some locations." Whether or not this is the case, however, is academic to the fundamental policy issues at hand. The core issue here is not about how many competitors there should ideally be in a given location, but that some locations have been unable to attract even a single entrant. Thus, the Commission should focus here on identifying the areas in which sufficient broadband and middle- and second-mile facilities do not yet exist, so that it can help foster deployment in those areas as set forth in Verizon's proposal above by subsidizing deployment of middle-middle facilities.

The Public Notice (Q. 4b) next asks about the extent to which broadband providers "self-provide or integrate components of middle mile and/or second mile transport." As discussed above, Verizon has self-provided all or virtually all of the middle-mile and/or second-mile facilities in its wireline broadband networks. Verizon Wireless also has self-provisioned wireless backhaul from its cell sites to its Mobile Switching Centers (or hub locations) in some cases.[100] When Verizon Wireless self-provisions wireless backhaul it is normally accomplished using microwave. Verizon Wireless will often self-provision backhaul to remote cell sites that are not served by any

[100] Verizon Wireless also obtains a significant amount of its backhaul from Verizon's wireline operations.

existing provider and where the costs of having another provider deploy facilities to that location would be prohibitive. In many such cases, the costs associated with a microwave shot are lower than the costs quoted by other providers. As noted above, going forward as Verizon deploys 4G LTE, it will evaluate if using microwave continues to make sense in these circumstances.

Other types of wireline and wireless broadband providers also are self-providing what the Public Notice describes as the middle- and second-mile components of their networks. As discussed extensively above, cable operators typically self-provision all or virtually all of the second-mile facilities in their networks, and also self-provision some of their middle-mile facilities. Clearwire is deploying a new nationwide WiMax-based wireless network and plans to self-provision backhaul using microwave facilities to satisfy the overwhelming majority of its demand.

Next, the Public Notice (Q. 4c) asks to identify the categories of the capital expenditures and operating expenses of constructing second-mile and middle-mile facilities. For fiber-based middle-mile and second-mile facilities, capital expenditures include those costs associated with outside plant and circuit equipment investment. Outside plant investment includes the necessary labor and material to install support structures (poles, conduit, and trenching), and to place fiber cables on or within these structures.[101] Circuit-equipment investment includes SONET, Ethernet, and other transmission equipment, as well as labor costs (for engineering, furnishing, and installing circuit equipment). With respect to operating expenses, the major categories are

[101] In many cases existing conduit and poles may be used whereby capital expenditures may be replaced by pole-attachment or conduit leasing arrangements.

maintenance, testing, network administration, and engineering expenses required to efficiently manage and operate the network facilities described above.

The Public Notice (Q. 4d) asks about the extent to which long-haul network providers offer middle- or second-mile connections to areas that are "passed" by their long-haul fiber. That depends on what "passed" means in this context. In general, long-haul network providers make decisions about whether to extend their networks based on whether the revenues they can obtain exceed the costs of such deployment. The more concentrated a given area and the closer it is to the long-haul provider's network, the more likely the provider is to deploy to that area; conversely, the less concentrated a given area and the further it is to the long-haul network, the less likely it is to attract facilities deployment.

These basic economics likewise affect the ability to attract capital, which the Public Notice asks about in Question 4e. To be sure, in the recent economic downturn capital markets in general are more constrained than they have been in past years. But the areas that are failing to attract capital today also failed to do so before the downturn. Moreover, despite recent economic conditions, an enormous amount of broadband investment is still occurring where it makes economic sense – including Verizon's $23 billion investment in FiOS, and more than $40 billion in annual investment in wireless networks.

Question 4f asks about the extent to which competing or neighboring broadband service providers work together to upgrade and share middle- and second-mile facilities. As shown above, there are many instances of rural providers forming consortia to help attract investment.

Question 4g asks whether government intervention is needed to facilitate middle- and second-mile facilities deployment, and, if so, how best to accomplish that. Verizon's response is set forth in Part II above.

E. Question 5: Nature of Competition and Availability of Alternatives

As detailed in Part III above, more than 90 percent of U.S. households and businesses have access to broadband services, and the vast majority of customers have access to at least two wireline broadband networks, three or more mobile wireless broadband networks, and at least two satellite broadband providers – a level of intermodal competition present in few if any other places in the world. Rapid progress also has been made in deploying next-generation wireline and wireless technologies, including FiOS, DOCSIS 3.0, and LTE. As further described above, wireline broadband providers frequently self-provision middle- and second-mile facilities to support their broadband services, while wireless broadband providers have used a combination of self-provision and facilities and transmission services obtained from a range of competitive suppliers, including cable companies, fixed wireless carriers, CLECs, and ILECs.

The Public Notice (Q. 5a) asks how firms compete in providing middle-mile connections, such as "on a circuit-by-circuit basis, by offering connectivity to specific points specified by the customer, or do firms 'compete for the customer by offering customers the ability to order a set of particular circuits at certain averaged or specified prices or terms." Verizon competes in all of these respects. Some customers purchase high-capacity services for individual or a small number of locations or routes, while other customers enter into broad contracts that cover their high-capacity needs across a wide

geographic footprint. Other broadband providers, including wireless carriers, typically purchase high-capacity backhaul facilities using this latter approach.

The Public Notice (Q. 5b) next asks about price competition for special access, and whether the nature of competition varies between areas and how this affects the ability to obtain middle- and second-mile facilities. As explained above, however, much of the middle-mile and second-mile facilities at issue here do not involve special access. Rather, these facilities are self-provisioned or purchased from a variety of providers, including cable companies, fixed wireless providers, competitive LECs, utility companies, regional fiber providers, and national long-haul network operators. While competition may not be uniform at all locations, the ability of competitors to serve customers throughout the areas where demand for high-capacity services is concentrated – along with the fact that ILEC special access rates are set over broad geographic areas[102] – ensures that competition disciplines prices throughout those areas, and not merely with respect to the individual locations to which competitors have already deployed wireline or intermodal facilities. In any event, as Verizon has previously explained, competition has driven down the prices customers pay for incumbent carriers' special access services. Between 2002 and 2008, the rates customers pay for Verizon's DS1 and DS3 services have declined and in 2008 were 24 percent lower than in 2002 in real terms. Competitors have also noted the low prices for these special access services. For example, Sprint's Chief Technology Officer said that T-1 lines, the most common type of high-capacity

[102] *See Verizon Communications, Inc. and MCI, Inc. Applications for Approval of Transfer of Control*, Memorandum Opinion and Order, 20 FCC Rcd 18443, ¶ 48 & n.131 (2005). ILEC special access rates are set across broad regions that are roughly as large in size as an MSA. *See* 47 C.F.R. § 69.3(e)(7).

connection to cell sites, are "[r]elatively abundant and inexpensive" in the United States.[103] Likewise, Don McCullough, Ericsson's head of marketing for IP Broadband, said that "[i]n the U.S. the ability to lease T1s has retarded microwave: it's always been less expensive to lease T1s."[104]

The Public Notice (Q. 5d) asks whether contractual terms and conditions in typical contracts for middle- and second-mile facilities, including term requirements and discounts, hinder or impede the development of competition. To the contrary, these provisions overwhelmingly benefit consumers, as Verizon has previously explained. Indeed, many of the term and volume discounts and other contractual provisions that Verizon offers were developed at the behest of Verizon's customers. For example, one of the features that customers have sought is the ability to aggregate their demand across broad geographic areas, and they also have sought uniform pricing structures across those areas. Verizon has accordingly introduced plans that allow customers to aggregate their demand across broad regions or, more recently, the entire country. These plans offer the same pricing structures regardless of location within a tariff region, which means that customers get the benefits of competition wherever they purchase service.

Customers have also sought plans that offer greater flexibility when their needs and demand change. Verizon has accordingly introduced a broad range of plans to provide customers this flexibility. For example, Verizon has introduced plans that allow

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[103] Stephen Lawson, *Sprint Picks Wireless Backhaul for WiMAX*, Industry Standard (July 9, 2008), http://www.thestandard.com/news/2008/07/09/sprint-picks-wireless-backhaul-wimax (citing Sprint CTO Barry West).

[104] *See* Anne Morris, *Microwave To Retain Key Role in Wireless Backhaul, As Fibre Waits in Wings*, Total Telecom (Sept. 2, 2009), http://www.totaltele.com/view.aspx?ID=448534.

customers freely to move individual circuits in and out of service, without incurring a fee for terminating a particular circuit, as long as they maintain a minimum volume commitment. Verizon also has introduced circuit-specific plans that provide the same level of discounts without requiring any volume commitment. Both of these types of plans allow customers to terminate circuits prior to the expiration of their original term commitment without paying onerous termination fees. In the event of early termination, the customer is merely required to pay the difference between the discount it received based on the original term commitment and the discount to which it would have been entitled based on the actual term for which the circuit was in service.

The Public Notice (Q. 5e) next asks about the extent to which demand for high-capacity services is concentrated. In the case of Verizon, nearly 80 percent of revenues are generated in its top 25 MSAs, and within these MSAs special access demand is concentrated in the downtown core of cities or in certain suburban areas in which there are large numbers of customers in communications-intensive industries.[105] Further, nearly 80 percent of the demand for Verizon's high-capacity special access services (as measured by revenues) is concentrated in approximately 15 percent of the wire centers where Verizon bills high-capacity special access (or 745 wire centers).[106] According to a recent report by USTelecom on high-capacity facilities, "approximately half of ILEC special access revenue is concentrated in the top 25 largest MSAs." The US Telecom report also shows that, within these top MSAs, demand for ILECs' special access

[105] *See* Declaration of Patrick A. Garzillo ¶ 3 & Exh. 1, *attached to* Comments of Verizon, *Special Access Rates for Price Cap Local Exchange Carriers*, WC Docket No. 05-25 & RM-10593 (FCC filed Aug. 8, 2007).

[106] *See id.* ¶ 3.

services is concentrated further still, in the wire center serving areas with the highest concentration of business customers.

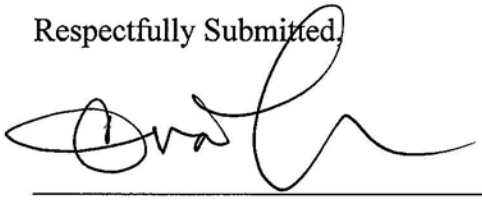
Finally, the Public Notice (Qs. 5e, 5f) seeks to identify the routes served by more than one provider of middle-mile or second-mile facilities. But this exercise has little bearing on the issues at hand. As discussed above, in the areas of the country where most Americans reside, there are multiple broadband providers and associated middle- and second-mile facilities. These various providers all compete, but often use very different network architectures that require high-capacity service along different routes. For example, cable headends and telephone company central offices are in different locations, and therefore require second- and middle-mile facilities along different routes. Similarly, while many wireless carriers share some cell site locations, that is not the case in many other locations. In all cases, however, most consumers have multiple broadband alternatives (including for middle- and second-mile facilities to support those services), regardless of how many competitors exist along any given route.

The main issue here, however, is that there are still low-density rural locations where the deployment of broadband services and middle- and second-mile facilities remains uneconomic. These areas have been unable to attract a single facilities-based provider of such facilities, because no broadband provider can justify the cost of such facilities given the anticipated revenues at stake. Identifying the number of facilities-based providers along routes where the economics have been able to attract broadband deployment does not further the process of trying to spur deployment in areas where the economics remain unfavorable.

V. CONCLUSION

To deliver broadband to Americans that still lack access to it, the Commission should develop a solution designed to address those particular areas characterized by low density and long distances, including a targeted support program to subsidize directly part of the cost of deploying and operating middle- and second-mile facilities with universal service funds in those areas where the economics of such facilities pose a barrier to broadband deployment, based on objective and verifiable criteria.

Respectfully Submitted,



Michael Glover
Of Counsel

Edward Shakin
Christopher M. Miller
VERIZON
1320 North Courthouse Road
9th Floor
Arlington, Virginia 22201
(703) 351-3060

John T. Scott, III
William D. Wallace
VERIZON WIRELESS
1300 I Street, NW
Suite 400 West
Washington, DC 20005

Evan T. Leo
Kellogg, Huber, Hansen, Todd,
Evans & Figel, P.L.L.C.
1615 M Street, NW, Suite 400
Washington, DC 20036
(202) 326-7930

November 4, 2009

ATTACHMENT 1

REDACTED – FOR PUBLIC INSPECTION

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ATTACHMENT 2

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