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

COMMENTS OF AT&T INC.
ON NBP PUBLIC NOTICE #6, SPECTRUM FOR BROADBAND

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SUMMARY

In these comments, AT&T responds to the sixth Commission Public Notice concerning the National Broadband Plan. This Public Notice requests structured comment on a series of questions related to the sufficiency of spectrum for broadband wireless services, including licensed mobile networks, unlicensed operations, fixed wireless broadband, and backhaul. As discussed herein, AT&T fully agrees with Chairman Genachowski that a spectrum crisis is looming, and that a shortage of spectrum could be a threat to the future of wireless broadband service in America. AT&T accordingly urges the FCC, in conjunction with NTIA, to act quickly with respect to the recommendations set forth herein, including identifying an additional 800 MHz to 1 GHz of spectrum suitable for mobile services below 4 GHz, immediately allocating the 1755-1780 MHz band to form an internationally harmonized mobile band with the existing 2155-2180 MHz spectrum block, and considering spectrum above 4 GHz for additional point-to-point backhaul purposes.

The first questions posed by the FCC seek information on the ability of existing mobile spectrum to support anticipated data demands. As AT&T discusses below, the combination of a growing subscriber base, increased adoption of sophisticated devices, broader use of web-enabled applications, and inexpensive rate plans have resulted in data requirements that are rising—and will continue to rise—meteorically. AT&T has experienced a 5,000 percent increase in data utilization in merely 12 quarters. While network operators have undertaken measures to enhance network capacity by increasing frequency re-use, the additional capacity that can be extracted is orders of magnitude less than what will be required. Moreover, the jump to 4G technologies will require new, greenfield allocations of substantial bandwidth. Modeling by the

International Telecommunications Union, in fact, suggests an additional 800 MHz will be needed by 2015 to support mobile broadband services in the United States.

The second series of questions posed in the Public Notice request information on which bands are most suited for reallocation for mobile services. AT&T looks forward to working with the FCC and NTIA to identify specific bands for reallocation. In such regards, AT&T suggests four criteria that must be balanced to optimize broadband deployment: (1) allocating large contiguous blocks capable of efficiently supporting new modulation schemes, (2) providing for reasonable uplink and downlink separation with due regard for interference to and from adjacent services, (3) identifying spectrum within internationally harmonized bands, and (4) focusing efforts in the spectrum range between 450 MHz and 4000 MHz to ensure appropriate propagation characteristics. In the immediate timeframe, AT&T urges the Commission to initiate a review of government spectrum use and to reallocate the 1755-1780 MHz band, which could be immediately paired with existing AWS 3 spectrum to form a paired, and harmonized, allocation.

The Commission's next questions seek feedback on the availability of spectrum for fixed wireless broadband. AT&T suggests that, consistent with more recent allocation policies, the market and consumers should dictate what resources are dedicated for fixed and mobile services, and that future spectrum allocations avoid rigid use limitations unless compelled by interference concerns. To the extent that spectrum must be set aside for fixed services, AT&T suggests use of bands that are not presently feasible for mobile service, including bands above 4 GHz.

The fourth set of questions in the Public Notice seek input on whether regulatory changes are necessary to ensure that spectrum reaches its highest and best use. AT&T strongly believes that the current evolution of market-based policies, which uses auctions of exclusive licenses

with regulatory flexibility, coupled with a secondary market, ensures that commercial spectrum rises to its most highly valued use. There is simply no basis for reversing course on these established and highly successful policies.

The FCC's final questions concern the sufficiency of backhaul spectrum in view of the extraordinary rise in data use. Although most carriers are upgrading their facilities to fiber optics, where possible, AT&T has some concern regarding the continued availability of long-haul microwave spectrum to backhaul remote rural cell sites to switching centers in urban areas. AT&T believes that the FCC should consider allocating additional spectrum for such long-haul paths. For intra-urban links, on the other hand, the record demonstrates that a range of competitive options exist, including private fiber, third party backhaul, and millimeter wave spectrum, among others. AT&T, in fact, believes that the worst outcome would be for the FCC to distort competitive forces in that market by intervening in special access rates.

The widespread use of mobile broadband has tremendous potential to reshape the way that the public can communicate, seek entertainment, and conduct business, Recent experience with the meteoric uptake in data clearly demonstrates that, with better networks, devices and software, Americans will eagerly adopt mobile broadband technologies. To ensure this virtuous cycle continues to enrich our lives, AT&T fully concurs with the FCC that additional spectrum must be a critical priority for the FCC. AT&T looks forward to continuing to work with the FCC, and NTIA, to meet the needs of subscribers in the world of 4G services and offerings.

TABLE OF CONTENTS

Page

Page

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COMMENTS OF AT&T INC.
ON NBP PUBLIC NOTICE #6, SPECTRUM FOR BROADBAND

AT&T Inc. ("AT&T") hereby submits its comments on the sixth of the National Broadband Plan Public Notices issued by the FCC.[1] In this *Spectrum Notice*, the Commission has sought "focused comment on the sufficiency of current spectrum allocations … for purposes of the Commission's development of a National Broadband Plan."[2] AT&T concurs with Chairman Genachowski, who correctly observed both that "[s]pectrum is the oxygen of our mobile networks" and that "the biggest threat to the future of mobile in America is the looming

[1] Comment Sought on Spectrum for Broadband, NBP Public Notice # 6, GN Docket Nos. 09-47, 09-51, 09-137 (rel. Sept. 23, 2009) ("*Spectrum Notice*").

[2] *Id*. at 1.

spectrum crisis."[3] As discussed below, AT&T further agrees that "[u]nleashing spectrum for 4G mobile broadband and beyond"[4] is appropriately one of the key points of the FCC's "Mobile Broadband Agenda," and urges the FCC to act on that agenda consistent with the comments below.

Q1. WHAT IS THE ABILITY OF CURRENT SPECTRUM ALLOCATIONS TO SUPPORT NEXT-GENERATION BUILD-OUTS AND THE ANTICIPATED SURGE IN DEMAND AND THROUGHPUT REQUIREMENTS?

As the Commission has recognized, U.S. operators have made and announced plans to deploy the next generation/4G network technologies such as Long Term Evolution ("LTE") and LTE-Advanced.[5] To migrate to LTE on a broad scale, however, wireless companies will need a "wide band of clean spectrum"[6] and it is also widely understood that significant additional spectrum will be required to meet capacity demands and provide true wireless broadband services nationwide. As Motorola has noted, for example, "[i]t is clear that existing bands will not be enough for IMT [International Mobile Telecommunications, the International Telecommunication Union ("ITU") standard for 3G and 4G technologies including LTE]

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[3] Prepared Remarks of Chairman Julius Genachowski, Federal Communications Commission, "America's Mobile Broadband Future," International CTIA WIRELESS I.T. & Entertainment San Diego, California (Oct. 7, 2009) at 4, *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-293891A1.pdf.

[4] *Id.*

[5] Notice of Inquiry, *Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993; Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless including Commercial Mobile Services*, WT Docket No. 09-66 (rel. Aug. 27, 2009) ("*Wireless Competition NOI*") at ¶ 24.

[6] Blair Levin *et al.*, Stifel, Nicolaus & Co., *What 700 MHz Winners Can Do with Their Spectrum* at 3 (Apr. 15, 2008) ("Because LTE is an OFDM (orthogonal frequency-division multiplexing) system, the transition is different than previous Verizon/AT&T transitions. When they went from 1xRTT to EVDO or from TDMA to GSM to Edge, they had base stations that used some spectrum on the older technology and some on the new. With LTE, the companies can't gradually migrate spectrum and users to the new standard as 4G equipment supply and service demand ramp up. Instead, they need a wide band of clean spectrum to build complete systems from scratch.").

services approximately after the year 2015 and additional bands are needed. In order to deliver a true broadband experience, large blocks of spectrum will need to be identified and allocated."[7] For this reason, the ITU, which has engaged in an in depth study of future spectrum needs, has concluded that on the order of 800 MHz to 1 GHz will be necessary to avoid stifling future broadband growth for wireless markets such as the United States. While domestic network operators are empirically some of the most spectrum efficient licensees in the world, even with new techniques and modulation schemes, existing commercial mobile radio service ("CMRS") allocations do not have the ability to absorb the projected growth in demand. The consequences of not rising to this spectrum challenge are huge—among other things, lost productivity and competitiveness for U.S. industries and the failure to meet consumers' bandwidth requirements as well as realize wireless broadband's promise to bridge the digital divide.

A. Wireless Demand Is Exploding

While 4G networks will offer performance improvements over 2G and 3G technologies, as documented in comments filed by AT&T in the FCC's competition and innovation dockets,[8]

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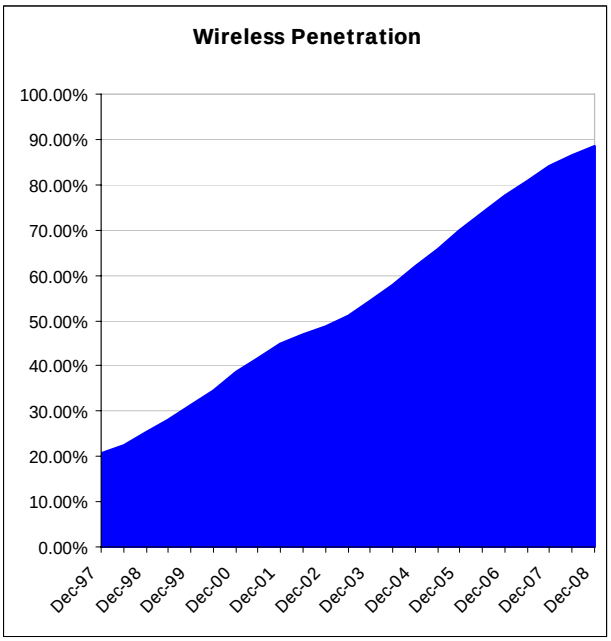
[7] Motorola, *White Paper: Spectrum Analysis for Future LTE Deployments*, at 5 (2007), *available at* http://www.motorola.com/staticfiles/Business/Solutions/Industry%20Solutions/Service%20Providers/Wireless%20Operators/LTE/_Document/Static%20Files/LTE_Spectrum_Analysis_White_Paper_New.pdf (stating "ITU (ITU-R M.2078) projects overall spectrum requirements for the future development of IMT-2000 and for IMT-Advanced. The results assert that additional spectrum demand of between 500 MHz and 1 GHz will be needed in all ITU regions by 2020."). Indeed, Clearwire's Chief Technology Officer has claimed that Clearwire's decision to use WiMax instead of LTE will give it a competitive advantage over traditional wireless carriers because it "believe[s] the LTE operators will be hard-pressed to find the spectrum to build a nationwide broadband network." Unstrung.com, *Clearwire: We're Ready for Primetime* (June 12, 2008) (quoting Clearwire CTO John Saw), *available at* http://www.unstrung.com/document.asp?doc_id=156240.

[8] *See* Comments of AT&T Inc., *Fostering Innovation and Investment in the Wireless Communications Market*, GN Docket No. 09-51, GN Docket No. 09-157 (filed Sept. 30, 2009) ("*AT&T CMRS Innovation Comments*"); Comments of AT&T Inc., *Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993 and Annual Report and Analysis of Competitive Market Conditions with Respect to Mobile Wireless Including Commercial Mobile Services*, WT Docket No. 09-66 (filed Sept. 30, 2009) ("*AT&T CMRS Competition Comments*").

demand for wireless capacity has exploded and technology alone will not suffice to meet demand. Not only has the number of subscribers to wireless services increased, those subscribers' demand for voice minutes and data bandwidth has grown exponentially. Moreover, the innovations introduced into the next generation networks deployed by AT&T and others have given rise to a host of new services that will create additional capacity needs. Pointedly, these developments are ones that should be nurtured and encouraged—the vast benefits of a mobile broadband society should not be throttled by a lack of spectrum capacity.

Competition and innovation have driven both widespread subscriber growth for mobile carriers and increased usage by those subscribers. According to CTIA's mid-year survey,[9] wireless penetration continues to grow at a steady pace. This is remarkable when the data reflects a period of extreme economic distress in the general economy. Moreover, as noted in the *AT&T CMRS Competition Comments*, a byproduct of the robustly competitive market is that providers have continuously unleashed innovative new calling plan concepts that have driven additional demand.[10] Indeed, CTIA



[9] CTIA Semi-Annual Wireless Survey, Mid-Year 2009 Top-Line Survey Results at 5, available at: http://files.ctia.org/pdf/CTIA_Survey_Midyear_2009_Graphics.pdf ("*CTIA 2009 Mid-Year Survey*").

[10] *AT&T CMRS Competition Comments* at 11, 28-33.

has shown that U.S. subscribers generate some of the highest per user Minutes of Use ("MOUs") and the lowest amount of revenue per MOU of any developed country.[11] In the first half of 2009 alone, U.S. wireless consumers used over 1.1 *trillion* MOUs.[12]

The capacity demands of subscribers are rising even faster in the digital domain. In the United States, a staggering 84 percent of all mobiles are capable of Internet access, and almost 90 percent are data capable.[13] Another recent survey indicates that there are 26.1 million integrated device—or smartphone—users in the U.S., a year over year increase of 72 percent from the second quarter of 2008.[14] AT&T's own customer base shows that 41.7 percent of AT&T post-paid customers have integrated devices.[15] And, demonstrating that smartphones are now integral to all walks of society, a recent Nielsen Mobile study found that, in terms of mobile web audience profiles, the largest growth areas were not traditional "early adopters," but rather the over-65 market segment (67 percent year over year growth) and the 13-17 segment (45 percent).[16]

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[11] *The Facts About the Wireless Industry: An Independent Review*, CTIA (June 2009), *available at* http://files.ctia.org/pdf/CTIA_Position_Paper_Independent_Assessment_of_the_Wireless_Industry_v6.pdf.

[12] *CTIA 2009 Mid-Year Survey* at 7.

[13] Ralph de la Vega, President and Chief Executive Officer, AT&T Mobility & Consumer Markets, Remarks at CTIA Information Technology '09 (Oct. 7, 2009) ("*de la Vega CTIA Keynote*").

[14] NielsenWire, *Global Mobile – Strategies for Growth* (Oct. 7, 2009), *available at* http://blog.nielsen.com/nielsenwire/online_mobile/global-mobile-strategies-for-growth/

[15] Press Release, AT&T, *Record Wireless Gains, Double-Digit Growth in IP-Based Revenues, Strong Cash Flow Highlight AT&T's Third-Quarter Results* (Oct. 22, 2009), *available at* http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=27290,

[16] NielsenWire, *Women, Teens, and Seniors Help Fuel 34% Mobile Web Spike* (Sept. 30, 2009), *available at* http://blog.nielsen.com/nielsenwire/online_mobile/mobile-web-up-34-percent-july-09/.

The increase in data capable mobile devices, and the availability of more applications and better user interfaces, has driven data demand to extremes. A recent Pew Internet report, *Wireless Internet Use*, reported:

> One-third of Americans (32 [percent]) have used a cell phone or Smartphone to access the internet for emailing, instant-messaging, or information-seeking. This level of mobile internet is up by one-third since December 2007, when 24 [percent] of Americans had ever used the internet on a mobile device. On the typical day, nearly one-fifth (19 [percent]) of Americans use the internet on a mobile device, up substantially from the 11 [percent] level recorded in December 2007. That's a growth of 73 [percent] in the 16 month interval between surveys.[17]

Thus, not only are more users *capable* of using mobile devices to access the Internet, it is clear of that more of them are *actually* using mobile devices to access the Internet; AT&T has also found that not only are more subscribers *actually* using mobile devices to access the Internet, those users are using mobile devices to access the Internet *more often*.[18]

As a final matter, AT&T notes the emergence, as discussed in the *AT&T CMRS Innovation Comments*, of a range of new services and products predicted to place additional demands on mobile networks. For example, netbooks, personal GPS location technologies and e-readers employ mobile connectivity to enable core requirements or enhance the user experience.[19] AT&T also discussed at length the emergence of the "machine-to-machine" or

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[17] Pew Internet & American Life Project, *Wireless Internet Use* (July 2009), *available at* http://www.pewinternet.org/~/media//Files/Reports/2009/Wireless-Internet-Use.pdf ("*Wireless Internet Use*").

[18] A remarkable 98 percent of iPhone users employ the data features of their phones, they are four times as likely to use the Internet as a typical subscriber, five times as likely to download an "app," six times as likely to watch mobile video, and seven times as likely to use location based services. NielsenWire, *iPhone Users Watch More Video… and are Older than You Think* (June 10, 2009), *available at* http://blog.nielsen.com/nielsenwire/online_mobile/iphone-users-watch-more-video-and-are-older-than-you-think/ .

[19] *AT&T CMRS Innovation Comments* at 46-47.

"M2M" market, allowing the development of smartgrid technology and a broad range of industrial, transportation, medical, and other applications.[20] While some of these applications are relatively low bandwidth, and others are potentially able to use capacity at non-peak hours, other applications—like netbooks—are anticipated to require potentially greater capacity than traditional mobiles during the same peak demand hours.

When these factors are combined—increased subscribers, increased voice usage, increased data device and smartphone adoption among subscribers, greater use of web-enabled applications by users—the impact is staggering. AT&T's wireless data traffic has increased by nearly *5,000 percent* in the past 12 quarters,[21] and other carriers likewise have reported dramatic increases.[22] And, this growth is likely to be sustained in the future. One analyst recently estimated that "mobile traffic will have a CAGR (Compound Annual Growth Rate) of 130 percent from 2008 through 2012 – that is, 1 MB of traffic in 2008 will equal 28 MB of traffic in

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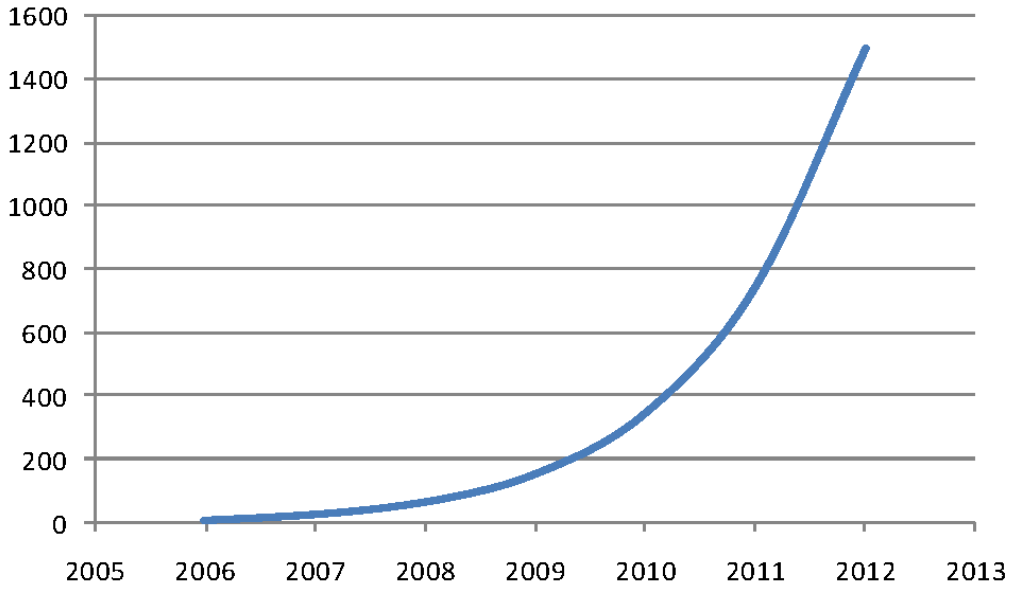
[20] *Id*. at 47-52.

[21] In such regards, the *Spectrum Notice* cites Kris Rinne, Senior Vice-President, Architecture & Planning, AT&T, for the proposition that "[t]he ability of AT&T to handle the 5,000% growth in data usage over the past three years relies upon broad contiguous bands of spectrum." While Ms. Rinne did note that AT&T has seen nearly 5,000 percent growth in data use, she did not indicate that AT&T's ability to accommodate that growth was due to contiguous spectrum held by AT&T. Kris Rinne, Senior Vice President, Architecture & Planning, AT&T, Remarks at the FCC Broadband Hearing (Technology/Wireless) at 6 (Aug. 13, 2009) (transcript available at http://www.broadband.gov/docs/ws_06_tech_wireless_transcript.pdf) ("*Rinne Testimony*"). In fact, Ms. Rinne testified that "[o]ften when we talk about … LTE we focus on speeds and it does give us the opportunity for higher data rates … as long as we have broad contiguous bands of spectrum," but she was speaking prospectively. Thus, the ability to accommodate traffic is related to additional spectrum, but the ability to handle traffic in a spectrally efficient way is related to bandwidth, at least for LTE. *Id*.

[22] *See, e.g., Ex Parte* Letter from Kathleen O'Brien Ham, T-Mobile USA, to Marlene H. Dortch, Federal Communications Commission, GN Docket No. 09-51, WT Docket No. 06-150, PS Docket No. 06-229, WT Docket No. 05-265, WT Docket No. 00-193, WC Docket No. 05-25, at 9 (filed Aug. 6, 2009) ("T-Mobile G1 customers use 50 times the data of the average T-Mobile customer"); *see also AT&T CMRS Innovation Comments*, Faulhaber & Faber Decl. at 12-13 ("*Faulhaber & Faber Declaration*").

2012."[23] Ralph de la Vega, President and Chief Executive Officer of AT&T Mobility & Consumer Markets, noted at a recent CTIA keynote that "by 2013 U.S. consumers will use nearly 400 petabytes per month of wireless data compared with 6 petabytes per month in 2008."[24] This is consistent with Cisco's projections for global mobile data, which shows a frightening increase in data requirements for the foreseeable future:



Cisco Global Mobile Data Projection, Petabytes per Month[25]

B. Substantial Additional Spectrum Resources Are Required To Meet Future Mobile Broadband Needs

As the *Spectrum Notice* cites, there are a number of studies concluding that substantial additional spectrum is needed for wireless services.[26] For example, the ITU initiated a study that

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23 Yankee Group, *Mobile Backhaul: Will the Levees Hold*?, Anchor Report (June 2009).

24 *See de la Vega CTIA Keynote*.

25 Cisco has estimated 116 percent CAGR for mobile data globally. Cisco, *Approaching the Zettabyte Era* (June 16, 2008), *available at* http://www.cisco.com/en/US/solutions/collateral/ns341/ns525/ns537/ns705/ns827/white_paper_c11-481374_ns827_Networking_Solutions_White_Paper.html.

26 *Spectrum Notice* at 2-3.

resulted in a 2006 report on estimated spectrum requirements.[27] The ITU Report attempted to estimate the additional spectrum amounts that would be needed for mobile broadband services in 2010, 2015 and 2020. In reaching its conclusions, the ITU Report included variations for different countries that had developed mobile capabilities earlier ("higher market setting") or later ("lower market setting"), whether the country had a single operator or multiple operators,[28] and included analyses of different technologies deployed ("radio access technique groups" or "RATG"). The results and estimates of interest to the United States are based on RATG 1 and RATG 2, which include cellular mobile systems (or "2G") as well as 3G and 4G future technologies.

The ITU Report also made estimates for countries with more than one wireless network, providing spectrum estimates for countries with two, three, four or five wireless networks. Unremarkably, the spectrum estimates greatly increase for countries with multiple wireless networks/providers. As CTIA has noted consistently, the United States has the most wireless networks and least concentration among the group of the leading 26 countries in wireless technology.[29] As such, the United States would clearly be expected to have a higher demand for spectrum than other countries—and at the higher end of the ITU Report estimates.

CTIA has endeavored to interpret the results gathered by the ITU Report for the United States market. Rather than attempting to characterize the U.S. market by number of wireless

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[27] *Estimated Bandwidth Requirements for the Future Development of IMT-2000 and IMT-Advanced*, International Telecommunications Union, Report ITU-R, M.2079 (2006) ("ITU Report").

[28] The ITU Study recognizes that a single network would have substantial efficiencies over multiple networks redundant networks from a spectrum perspective (although obviously not from a competitive standpoint), and attempts to define the increased spectrum needs as a multiplicity of operators is introduced, *see, e.g.*, ITU Report at Tables 26(a) and (b).

[29] *See e.g.*, *Ex Parte* Communication, CTIA – The Wireless Association, GN Dkt. No. 09-51, filed Sept. 29, 2009 at 19 ("*CTIA Wireless Spectrum Ex Parte*").

providers, CTIA conservatively chose to use the ITU Report estimates for a single wireless provider in a low market setting as of 2015.[30] With this assumption, CTIA found that by 2015 the U.S. spectrum requirements would be 1300 MHz. Given that approximately 410 MHz already is licensed and an additional 50 MHz could readily be licensed, that leaves a deficit of more than 800 MHz for commercial wireless services within the next six years.

Of even greater note are the efforts that other countries have taken to address the findings of the report. In the United Kingdom, there are approximately 76 million subscribers with slightly more than 350 MHz of licensed CMRS spectrum. Ofcom, the UK spectrum regulator, has identified and is in the process of reallocating an additional 355 MHz of CMRS spectrum.[31] Germany, with 305 MHz of CMRS licensed spectrum, has identified 340 MHz of spectrum to be reallocated to German wireless broadband providers.[32] In sum, internationally there has been recognition of the need for additional CMRS spectrum and concrete actions have been taken by many foreign administrations to address these needs.

In response to the Commission's inquiry regarding innovation and investment in the wireless communications market, former Chief Economist Gerald R. Faulhaber and former Chief Technologist David J. Farber stated that by auctioning "lots and lots of spectrum," the Commission can "foster the deployment of 4G and future technologies."[33] Specifically, Professors Faulhaber and Farber recommended that the Commission auction 1 GHz of licensed spectrum.[34]

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30 *Id.*

31 *Id.* at 17.

32 *Id.* at 18.

33 *See Faulhaber & Farber Declaration* at 22.

34 *Id.*

C. Network Investment Alone Cannot Accommodate Demand for Service

As an aide to Chairman Genachowski recently explained, "[d]emand for more capacity is exploding and increased spectral efficiency can only do so much."[35] As CTIA has shown in its data provided to the Commission, in fact, U.S. wireless providers are already effectively and efficiently using their spectrum resources better than carriers in any other country in the world.[36] AT&T, for its part, has spent more than $38 billion to upgrade its wireline and wireless networks in the last two years alone, and AT&T will spend between $11 and $12 billion in the next year and a half within the current 3G framework to increase available bandwidth by deploying new cell sites, adding spectrum and upgrading to HSPA 7.2 Mbps.[37] As discussed below, however, these efforts cannot keep pace with a 5,000 percent increase in demand.[38]

In particular, AT&T is leading the industry in increasing the number, and reducing the size of wireless cells, improving interaction and handoffs between cells, and deploying "smarter"

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[35] Howard Buskirk, *Google Voice Shows Changes Overtaking Wireless Industry, Federal CTO Says*, Communications Daily (Sept. 16, 2009).

[36] With just under 410 MHz of CMRS spectrum – which includes spectrum in the AWS, 700 MHz and BRS bands that are not fully utilized yet to serve consumers – U.S. wireless providers are serving more than 270 million subscribers. *See CTIA Wireless Spectrum Ex Parte* at 16. This translates into better than 660,000 subscribers served per megahertz of spectrum allocated, an efficiency metric that is triple the efficiency of U.K. carriers, double the efficiency of Japanese carriers and more than six times the efficiency provided by Canadian wireless providers. *Id.*

[37] Andrew Berg, *Rinne: AT&T Ready for 4G Jump*, Wireless Week (Sept. 15, 2009); Press Release, AT&T, *AT&T to Make Faster 3G Technology Available in Six Major Cities This Year* (Sept. 9, 2009).

[38] *See, e.g.*, Tom Anderson, Head of Architecture for Mobility, Office of CTO, Alcatel-Lucent, Remarks at the FCC Broadband Workshop (Technology/Wireless) at 26 (Aug. 13, 2009) (stating "Although a lot of work is going on in my organization and in organizations [around] the globe to increase the efficient [use] of the spectrum and spectral efficiency . . ., fundamentally we're not going to be able to keep up with the growth rates that Kris [Rinne] talked about without more spectrum."), *available at* http://www.broadband.gov/docs/ws_06_tech_wireless_transcript.pdf.

handsets and infrastructure to reduce power and interference.[39] Technological measures, such as cell splitting and antenna sectorization, however, cannot overcome the extensive growth in demand. Cell splitting is the process whereby an existing cellular provider takes a large service area served by a single cellular base station and breaks it into many new service areas served by many new cellular base stations. An even more granular approach to cell splitting is use of femtocell technology. AT&T also plans to deploy femtocells within its network, which provide shorter-range wireless connectivity that can quickly offload calls to a very localized cell and thus reduce the load on the wide-area wireless network.[40] Cell splitting and use of femtocells unleashes additional capacity in the network and allows, in many cases, better data rates to be delivered to end users. However, the incredible compounding demands for mobile data services completely eclipse any gains from such improvements.[41]

Even if small percentage increases wrought by increased re-use could keep up with 5,000 percent growth—which it obviously cannot—the theoretical ability to increase efficiency does not mean that carriers have the actual ability to do so. For example, to achieve a significant increase in re-use efficiency, a carrier has to decrease cell serving areas, which means increasing cell density substantially. To increase cell density would require a large number of additional base stations. But, in some areas, the zoning approvals to build new towers—or even modify existing towers or antenna structures—may not allow (or allow on a timely basis) the expansion

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39 Press Release, AT&T, *AT&T to Make Faster 3G Technology Available in Six Major Cities This Year* (Sept. 9, 2009).

40 *AT&T CMRS Innovation Comments* at 32.

41 During the Fifth Wireless Broadband Workshop, a panelist suggested that widespread deployment of femtocells could result in "more than a doubling of capacity automatically so you need less spectrum." Kris Rinne from AT&T pointedly observed, however, that doubling was optimistic, but that, in any event, with "5,000 percent growth in the utilization on the data side, … doubling won't cut it." *Rinne Testimony* at 40.

needed. More sites also dictates the need for more backhaul and, as discussed in Section Q5, that may pose difficulties in some areas. Similar concerns are implicated even where simple sectorization is attempted, because the additional equipment installed at a site for sectorization may itself require significant legal, engineering, and regulatory modifications.

AT&T further notes that new, greenfield spectrum is also required for an operator to launch a new wide bandwidth technology. For example, to deploy LTE in an efficient manner would require at least 20 MHz of contiguous, paired spectrum—10 MHz each for uplink and downlink. Moreover, to avoid disrupting service to the more than 270 million wireless subscribers currently using 2G and 3G services, spectrum devoted to LTE (or other 4G services) must be clear of current services. In the future, for 4G systems to achieve their full potential, operators will need sufficient clear, contiguous spectrum to support 2x20 MHz or even 2x40 MHz channels.

D. Unlicensed Spectrum, While a Useful Adjunct To Licensed Spectrum, Cannot Alleviate Capacity Constraints

In addition to seeking comment on the need for licensed spectrum, the Commission also seeks comment on whether unlicensed devices have adequate access to spectrum to be used to provide wireless broadband services or as a complement to services provided over licensed spectrum.[42] AT&T, as the first carrier to deploy a large network of Wi-Fi hotspots and currently the largest Wi-Fi provider in the country,[43] is well-positioned to comment on the merits of unlicensed services. Unlicensed services have a role to play in today's wireless broadband marketplace, especially for high speed personal area networks ("PANs"). However, unlicensed services cannot and do not play a central role in the development and deployment of wide area

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42 *Spectrum Notice* at 5.

43 *AT&T CMRS Innovation Comments* at 31.

wireless mobile broadband networks.[44] The investment community will not invest in unlicensed spectrum which has uncertain licensee rights.[45] Moreover, unlicensed services are not capable of providing the type of quality of service expected by consumers and required by businesses for wireless mobile broadband services. Indeed, as the number of unlicensed devices grows, interference becomes more prevalent and there is no clear means of addressing such interference to increase the quality of service.[46] In sum, while these technologies may be capable of offloading some capacity from carrier-based networks in certain localized venues, the unlicensed approach is not a panacea for meeting future broadband needs.

Finally, and most importantly, the spectrum needs of the unlicensed community have been more than amply addressed by the Commission. Today, the U.S. makes more than twice as much unlicensed spectrum available as licensed spectrum, an amount that far exceeds that in other industrialized countries.[47] In light of these facts, AT&T believes strongly that the

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[44] Steve Corson, Vice President of Engineering, Qualcomm Flarion Technologies, Remarks at the FCC Broadband Workshop (Technology/Wireless) at 17 (Aug. 13, 2009) (stating "From a mobile broadband perspective, the consensus view at least at Qualcomm is that unlicensed spectrum doesn't cut it. We've love to see fruitful use in that application, but we can't figure out how to make it work.") (transcript *available at* http://www.broadband.gov/docs/ws_06_tech_wireless_transcript.pdf).

[45] *Id*. at 37 (stating "In the unlicensed world or when you view creating value of unlicensed space, you don't really own the spectrum, you own the geography within which the spectrum exists. So to the extent that you own a lot of geography, you can deploy unlicensed technologies in those geographies that have certain interference characteristics and you can create value to some extent, but once you don't own the geography anymore, and I'm thinking now of any densely populated area where really the propagation and interference of these technologies interact, you have a lot of difficulty creating value now in these very uncontrolled spaces.").

[46] Notably, AT&T, and other carriers, do utilize unlicensed spectrum in cases for temporary—or even semi-permanent—backhaul arrangements. In that context, unlicensed is a valuable tool, and no doubt the directionality of point-to-point systems provides additional reassurances against interfering use. Importantly, however, even in those cases, carriers typically have a "back up" plan in the event interference issues do arise.

[47] *AT&T CMRS Innovation Comments* at 76.

Commission should apply its resources to the identification of additional spectrum that can be licensed on an exclusive basis to address the growth in needs for wireless broadband services.

E. A Failure To Meet Wireless Demand Will Have Drastic Consequences

The consequences of failing to adequately plan for—and allocate—spectrum required to meet capacity demands will be dramatic. As commenters stated in the competition docket, spectrum is necessary to ensure and promote the most competitive market for mobile services, to the benefit of consumers everywhere. As numerous carriers also noted, the productivity and efficiency gains wrought by mobility solutions are critical to ensuring that U.S. industries remain competitive with their non-U.S. competitors. These factors are even more critical when mobile is positioned as a possible bridge across the so-called "digital divide."

As an initial matter, the U.S. market boasts vibrant competition because the FCC has historically been able to allocate spectrum in a manner that has reduced the impact of bandwidth as an entry barrier. The result of the allocation of resources to CMRS spectrum has been the emergence of niche competitors and multidimensional competition in local markets. Still, the industry has experienced capacity crunches before, as successful carrier innovation and the demands spikes that result can sometimes outstrip the available spectrum supply. Take, for example, the introduction of the AT&T Digital OneRate plan. That single rate plan (which eliminated long distance and roaming charges, offering nationwide service for one rate) so stimulated usage that AT&T Wireless (and other carriers forced by competition to follow suit) had severe capacity issues in New York and other areas as usage skyrocketed. That sort of groundbreaking innovation should be encouraged by ensuring that carriers have sufficient spectrum to meet all anticipated demand.

But, the ramifications of failing to provide adequately for mobile growth go beyond the impact on competition—they go to the core of the nation's economy and the ability of U.S.

businesses to compete in global markets. As Ralph de la Vega, President and Chief Executive Officer of AT&T Mobility & Consumer Markets, noted recently at CTIA's Information Technology keynote, what is at stake is "2.4 million American jobs" and "$19 billion in taxes and fees, each year" *in the wireless industry alone*. When national productivity gains as a result of wirelessly enabling business applications are considered, according to an Ovum study, failing to plan for spectrum needs places at risk "$860 billion in business productivity . . . over a 10 year period."[48] Failing to meet spectrum demands also prevents wireless from realizing its potential promise to act as a potential bridge across the digital divide.[49]

Q2. WHAT SPECTRUM BANDS ARE BEST POSITIONED TO SUPPORT MOBILE WIRELESS BROADBAND?

Because the need for additional CMRS allocations is evident, the *Spectrum Notice* also requests comment on "[w]hat spectrum bands are best positioned to support mobile wireless broadband."[50] AT&T submits that, to achieve the full benefit of wireless broadband growth, reallocations of spectrum for CMRS should balance several competing goals, making spectrum available: (1) in large contiguous blocks capable of efficiently supporting new modulation schemes, (2) with reasonable uplink and downlink separation with due regard for interference to and from adjacent services, (3) within internationally harmonized bands, and (4) in the spectrum

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48 *See de la Vega CTIA Keynote*.

49 According to the Pew Internet & American Life Project in their report *Wireless Internet Use*, "[t]he high level of activity among African Americans on mobile devices helps offset lower levels of access tools that have been traditional onramps to the internet, namely desktop computers, laptops, and home broadband connections." *Wireless Internet Use* at 4. The report found that "By a 59 percent to 45 percent margin, white Americans are more likely to go online using a computer on a typical day than African Americans"; however, "[w]hen mobile devices are included in the mix, the gap is cut in half; 61 percent of white go online on the average day when mobile access in included while 54 percent of African Americans do." *Id*. *See also* MobileFuture, *Hispanic Broadband Access: Making the Most of the Mobile, Connected Future* (Sept. 15, 2009) (noting similar trends for Hispanic Americans), *available at* http://www.mobilefuture.org/pages/hispanic_broadband.

50 *Spectrum Notice* at 5.

range between 450 MHz and 4000 MHz to ensure appropriate propagation characteristics. AT&T looks forward to working with the Commission and the National Telecommunications and Information Administration ("NTIA") to identify specific candidates for repurposing and ultimate reallocation. In the meantime, AT&T urges the Commission to take several short-term actions, including initiating a review of government spectrum use and reallocating the 1755-1780 MHz band, which could be immediately paired with existing AWS 3 spectrum to form a paired, and harmonized, allocation.

As stated in the *AT&T CMRS Innovation Comments*, to achieve the full benefits of wireless growth, reallocation of spectrum—and reallocation of the *right* spectrum—for mobile services is critical. As AT&T discusses below, the Commission should focus principally on four objectives:

- *First*, as AT&T and others have observed, LTE and other 4G standards require large contiguous spectrum bands to achieve throughput speed and, to a degree, efficiency. LTE, while capable of scaling for use in smaller bandwidth channels, does not achieve optimal spectrum efficiency gains until at least 20 MHz of bandwidth is accessible—which requires paired 20 MHz channels, or 40 MHz overall.[51] Future versions of the standard, LTE-Advanced, may use paired 40 MHz channels, or 80 MHz overall.

- *Second*, spectrum for wireless services must provide reasonable transmit/receive separation with compatible adjacent services, and the Commission should give due consideration to the compatibility of new allocations with existing (and future) adjacent services. As AT&T has discussed in other contexts,[52] failing to consider the compatibility of uplink and downlink bands with respect to both each other and other existing and future services can have dramatic consequences. For example, certain scenarios may require operators to create internal "guard bands" to protect weak transmissions, which negatively impacts spectral efficiency. Other situations may

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[51] Rysavy Research, HSPA to LTE-Advanced, EGPP Broadband Evolution to IMT-Advanced (4G) (Sept. 2009) at 22, available at: http://www.rysavy.com/Articles/2009_09_3G_Americas_RysavyResearch_HSPA-LTE_Advanced.pdf ("*Rysavy Analysis*").

[52] *See, e.g.*, Comments of AT&T Inc., *Service Rules for Advanced Wireless Services in the 2155-2175 MHz Band*, WT Docket No. 07-195 (filed Aug. 11, 2008) ("*AT&T AWS 3 Comments*").

require carriers to outfit receivers with complex and expensive filters, which has a tangible impact on the end user cost of such services. Providing sufficient interference protection for new mobile allocations will be critical to ensuring the most diverse economic availability of broadband services.

- *Third*, as noted in several studies and papers, spectrum for wireless services should be harmonized internationally to leverage global economies of scale. When U.S. wireless providers use the same spectrum as the rest of the world, device manufacturers and applications developers can take advantage of economies of scale associated with making a single device or application that can be used almost anywhere, rather than having to devote scarce resources to making separate devices and applications for the U.S. marketplace.

- *Fourth*, spectrum for wireless services needs to possess appropriate propagation characteristics. ITU, Rysavy Research and 3G Americas have developed technical studies on the need for ensuring that new spectrum identified for licensed, mobile services are below 4 GHz.[53] In short, spectrum between approximately 450 MHz and 4 GHz possesses propagation characteristics that are ideal for mobile services. Within the range identified by AT&T, and others, the spectrum does exhibit different characteristics, but the availability of a variety of options may actually marginally assist operators in addressing different coverage scenarios.[54]

AT&T looks forward to working with the Commission and NTIA in identifying spectrum that appropriately balances these goals.

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[53] *See, e.g., Rysavy Analysis.*

[54] While some propagation differences exist, within the currently usable range of spectrum, the difference should not be overstated. As the Commission has recognized, different propagation characteristics "translate into capital and operating cost differences," *Wireless Competition NOI* at ¶ 25. Lower frequencies generally have broader propagation, which in theory may permit a radio system to be deployed over the same area with fewer cells than with higher frequency spectrum. But as one wireless engineer has explained, "it cannot be assumed that any radio system operating in a lower frequency band will require fewer cells or be more economical to deploy and operate than another radio system operating in a higher frequency band," because other factors – such as the presence of large buildings or other physical impediments – also affect propagation. Joanne C. Wilson, *Understanding Spectrum Issues in the Deployment of Broadband Wireless Access Networks, Presentation to the Meeting of the South Carolina Senate Broadband and Telecommunications Technology Study Committee*, at 18 (Dec. 12, 2007), *available at* http://www.scstatehouse.gov/citizensinterestpage/BroadbandTechnology&CommunicationStudyComm/commentsandpresentations/JoanneWilsonPresentation.pdf.

It is evident historically that reallocation of spectrum for CMRS in the U.S. has taken a considerable amount of time.[55] Accordingly, AT&T commends the Chairman for making the search for 4G spectrum one of the core planks of his Mobile Broadband Agenda. AT&T notes that when network providers and other innovators do not know what spectrum, if any, may become available in the longer term, it reduces their ability and incentive to develop long term business plans and to raise the capital necessary to develop innovative uses for such spectrum. More advanced notice would provide the certainty necessary for innovators to more quickly begin raising capital and innovating. For these reasons, AT&T believes the Commission must begin to take concrete steps to provide for 4G spectrum needs.

As a near-term measure, AT&T also supports CTIA's suggestion to consider the immediate reallocation of the 1755-1780 MHz spectrum band for advanced wireless services.[56] This band meets all of the criteria noted by AT&T as being appropriate for mobile services. The 1755-1780 MHz band is internationally identified for IMT services, and is one of the very few that has not yet been allocated and licensed in the United States. The band can also be paired with the 2155-2180 MHz band (currently identified as AWS-2 and AWS-3 spectrum), forming a

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55 An inquiry into broadband Personal Communications Services was initiated in June of 1990, but the first A and B Block licenses were not generally granted until almost 5 years later. *See, Amendment of the Commission's Rules to Establish New Personal Communications Services*, Notice of Inquiry, 5 FCC Rcd 3995 (1990). The FCC proposed rules for AWS-1 in August of 2001, and the first licenses were not issued until the fourth quarter of 2006. *See Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems*, Notice of Proposed Rule Making, 16 FCC Rcd 596 (2001). In the 700 MHz band, the original rules were proposed in March, 2001, and, while some licenses were auctioned in 2002, the majority of the licenses were not auctioned until March of 2008. *See Reallocation and Service Rules for the 698-746 MHz Spectrum Band (Television Channels 52-59)*, Notice of Proposed Rule Making, 16 FCC Rcd 7278 (2001).

56 *AT&T CMRS Innovation Comments* at 70.

contiguous AWS band spanning from 1710-1780 MHz/2110-2180 MHz.[57] Indeed, rapidly reallocating and licensing 1755-1780 MHz would effectively make an additional 50 MHz of internationally harmonized spectrum available for licensed commercial services, since the current 2155-2180 MHz band is not technically suitable for 4G in its unpaired state. The band offers sufficiently large bandwidths to support efficient 4G services, and existing carriers already have experience in addressing the relocation issues likely to arise with Federal systems in the 1755-1780 MHz band, having recently been involved in the relocation of substantially similar users from 1710-1755 MHz.[58] For these reasons, AT&T supports immediate measures by the FCC and NTIA to reallocate the 1755-1780 MHz band for mobile services.

Allocating an additional 50 MHz of spectrum, however, is a small step towards reaching the 1 GHz or more of spectrum needed for next generation wireless services. In fact, AT&T recommends that the FCC coordinate with NTIA to inventory government bands for future spectrum planning efforts. As noted above, there remains a tremendous need for additional commercial licensed spectrum that cannot solely be met by repurposing existing non-Federal spectrum bands. Unlike non-Federal bands, there is a lack of transparency in the use and availability of Federal spectrum holdings. A targeted inventory effort conducted by NTIA and FCC that focuses on spectrum between 450 MHz and 4 GHz would be the best approach to enabling additional spectrum reallocation.

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[57] Indeed, the suggested reallocation would also beneficially eliminate potential interference concerns between existing AWS 1 licensees and TDD usage of an unpaired AWS 3 band. *See AT&T AWS 3 Comments*.

[58] *CTIA Wireless Spectrum Ex Parte* at 21.

Q3. WHAT SPECTRUM BANDS ARE BEST POSITIONED TO SUPPORT FIXED BROADBAND?

Consistent with its comments in response to Question 4 in the *Spectrum Notice*, AT&T does not believe that it is desirable, or necessary, to earmark spectrum for fixed broadband services. This is not to say that fixed broadband services should not be accommodated, but rather that imposing regulatory use restrictions, such as "fixed" versus "mobile," cut against the trend toward regulatory flexibility. As AT&T discusses in its response to Question 4,[59] allocations of spectrum should provide flexibility and the market should determine when, and how, spectrum is allocated as between fixed and mobile uses. To the extent that, for technical or other reasons, the Commission does consider a fixed allocation for broadband, that allocation should be made above the usable range for mobile services.

Q4. WHAT ARE THE KEY ISSUES IN MOVING SPECTRUM ALLOCATIONS TOWARD THEIR HIGHEST AND BEST USE IN THE PUBLIC INTEREST?

A. Auctions Are Proven Mechanisms To Achieve Appropriate Market-Based Allocation of Resources

As AT&T has documented in other recent comments, the phenomenal innovation displayed by, and competition exhibited in, the mobile industry can be tied to Congressional and FCC policies that permit network operators the flexibility to respond to market conditions. Key among those policies has been distribution of spectrum by open auctions with broad participation, licensing spectrum on an exclusive use basis with technical regulatory flexibility, and measures to promote the development of a functional and effective secondary market.

Open Spectrum Auctions. The Commission generally has not tried to restrict or dictate the uses to which the spectrum would be put, but instead has ensured that it would be put to its highest valued uses by auctioning spectrum licenses and permitting secondary market

[59] *See* Section Q4.B.

transactions, without any further restrictions unrelated to interference.[60] The Commission properly understood that competition would be the best driver of innovative and high quality services.[61] Accordingly, it auctioned spectrum licenses to the highest bidders, and allowed the licensees to judge, based on changing market conditions, which services would best serve customers.[62] The fact that the licenses typically are obtained at considerable cost also gives the winners powerful incentives to find the most highly valued uses, which in turn creates powerful incentives to pursue innovations that can help them to distinguish themselves from their competitors.

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60 *Service Rules for the 698-746, 747-762 and 777-792 MHz Bands*, Report and Order and Further Notice of Proposed Rulemaking, 22 FCC Rcd. 8064, ¶ 235 (2007) ("Congress and the Commission have determined that using competitive bidding mechanisms for assigning spectrum licenses offers significant public interest benefits. For example, the competitive bidding process ensures that spectrum licenses are assigned to those who place the highest value on the resource and will be suited to put the licenses to their most efficient use."); *Principles for Promoting the Efficient Use of Spectrum by Encouraging the Development of Secondary Markets*, Policy Statement, 15 FCC Rcd. 24178, ¶ 9 (2000) ("an active secondary market will facilitate full utilization of spectrum by the highest value end users"); *Bringing Broadband To Rural America: Report On A Rural Broadband Strategy*, Report, 2009 WL 1480862, ¶ 146 (2009) ("The Commission's rules permit licensees to transfer their licenses, or partition or disaggregate their licenses, in the secondary market with Commission approval. The Commission's secondary markets rules also provide flexibility to a wide array of wireless licensees, including broadband providers, to enter into spectrum leasing arrangements with other providers that seek access to spectrum in rural areas.").

61 *See, e.g., Amendment of the Commission's Rules to Permit Flexible Service Offerings in the Commercial Mobile Radio Services*, First Report and Order and Further Notice of Proposed Rule Making, 11 FCC Rcd 8965, ¶ 19 (1996) ("If we were to restrict fixed service to certain configurations . . . carriers might be reluctant to pursue some potentially efficient options out of concern that they would be considered to fall outside the definition of our prescribed service definition. Rather than limit the flexibility of carriers in this manner, we prefer to encourage innovation and experimentation through a broader, more flexible standard."). *See also Faulhaber & Farber Declaration* at 15-20; *AT&T CMRS Innovation Comments*, Katz Declaration at ¶¶ 61-74 ("*Katz Declaration*").

62 *See AT&T CMRS Innovation Comments*, Hazlett Declaration at ¶ 15 ("*Hazlett Declaration*"); Faulhaber, Hahn, & Singer, *Should the FCC Depart From More Than A Decade Of Market-Oriented Spectrum Policy? Reply To Skryzypacx and Wilson*, at 3 (June 2007) ("Since embracing auctions in the early 1990s, the [FCC] has consistently embraced a market-oriented spectrum policy that sought to maximize participation in spectrum auctions and allowed winning bidders to develop business models of their own choosing. The result has been nothing short of spectacular: wireless competition has thrived, as multiple carriers with differentiated products compete aggressively for customers").

Exclusive Use Rights with Technical Flexibility. Another keystone of prior FCC policy has been the creation of exclusive use rights for mobile licensees. This, coupled with flexible use policies, has resulted in U.S. carriers leading the world with respect to investment and spectrum efficiency. Broad flexible spectrum use policies have freed the wireless industry to innovate and compete to the benefit of U.S. subscribers. It has long been recognized in the economic literature that "[w]hen technology is in flux, businesses must adapt to remain innovative and to deploy efficiently new and improved technologies. This process of adaptation is critical to the operation of a market economy, and ultimately is driven by competitive forces. During such times of change, the need to reallocate and recombine existing assets is especially important. In the specific context of spectrum, economists have "applaud[ed] the important steps the Commission has taken toward flexible spectrum allocations" and have explained that "[m]ore flexible use of spectrum will unleash large efficiencies in spectrum management."[63]

Flexible use, in no small part, has been responsible for the great efficiencies achieved by U.S. carriers. Carriers like AT&T, for example, have been able to migrate from analog AMPS, first to digital TDMA, then to GSM, then to UMTS-HSPA, and ultimately to LTE, all without FCC intervention. Indeed, this somewhat understates the evolution of mobile systems for AT&T, which also deployed a range of data networks, including CDPD, Mobitex, and EDGE prior to UMTS-HSPA. The Commission's flexible policies have also facilitated pro-consumer collaborations by providing the flexibility for equipment manufacturers, carriers and others jointly to develop and provide telehealth services, energy grid services, integrated navigation services, netbooks, e-books, and other innovative machine-to-machine and similar offerings.

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[63] Gregory L. Rosston and Thomas W. Hazlett, Comments of 37 Concerned Economists, *Promoting Efficient use of Spectrum Through Elimination of Barriers to the Development of Secondary Markets*,WT Docket No. 00-230, at 1 (Feb. 7, 2001).

Ultimately, flexible use policies recognize that the carriers themselves are in the best position to judge potential negative impacts on their networks from competing uses and to internalize network decisions in an intensely competitive marketplace in which customers dissatisfied with their choices can vote with their feet.

One critical element of exclusive use rights that has promoted investment in CMRS systems has been the predictability and consistency of the regulatory regime. It therefore bears mention that, to the extent the Commission is seeking feedback on embarking on any *post hoc* revision of rights granted under CMRS licenses, the answer should be a resounding "no." As discussed in the *AT&T CMRS Innovation Comments*, calls to undermine spectrum rights through underlays, overlays, or through the pretense of "cognitive" systems should be rejected.[64] And, similarly, attempts to revise the build-out obligations and renewal rights of licenses—after those licenses have been sold for billions of dollars—must similarly be put to rest. The FCC, as part of the service rules for licenses established prior to auction, clearly set forth the terms under which licensees were entitled to renewal. To now contemplate a scheme for measuring licensee performance at renewal that contemplates penalties—including the implied loss of rights in "unserved or underserved areas"—would be a repudiation of the auction contract and undermine investor and bidder confidence in all future auctions.[65] Those proposals should be summarily rejected.

Promotion of an Efficient Secondary Market. The final leg of the FCC's market-based policies has been efforts to promote the functioning of an effective secondary market for

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64 *AT&T CMRS Innovation Comments* at 75-87.

65 As noted by Ralph de la Vega at his CTIA keynote: "rules should not change now after the money has been spent and even before the spectrum has been put to use"; "[w]hat would that say about the integrity of the 700 MHz auction and the confidence bidders should have about future auctions?" *See Genachowski Announces Agenda To Spur 4G Wireless Services*, TR Daily (Oct. 7, 2009), *available at* http://www.tr.com/online/trd/2009/td100709/index.htm.

spectrum. To the extent that there is any available *quanta* of "capacity" in commercial bands that could be made available to others, rules already exist that promote making such spectrum available.[66] Specifically, the Commission encouraged secondary market transactions, which allow additional parties to make use of the spectrum where the licensees have gaps in their own needs. Existing licensees have made enormous investments in their spectrum licenses, and thus have ample incentive to lease or sell spectrum to others where it would be worth more than the uses to which the licensee itself can put the spectrum.[67] The existence of active secondary markets thus provides significant additional opportunities to bring innovation to the marketplace. The licensed CMRS bands are in fact the most intensively shared spectrum bands of all.[68]

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[66] As Professors Faulhaber and Farber point out, "cognitive radio . . . can certainly pay its own way; licensees (who are no doubt a profit-making bunch) will be happy to permit truly non-interfering uses for a competitively determined market price. . . . There is no reason that this particular technology should get a free ride on spectrum" through federal mandates. *Faulhaber & Farber Declaration* at 21-22. Indeed, AT&T already has been using cognitive radio techniques in its network that allow the wireless base stations to sense and schedule traffic and thus achieve better efficiency, and AT&T and standards bodies (*e.g.*, 3GPP) have continued to improve and extend the uses for these techniques. These implementations, however, are under the centralized control of the network, so that the cognitive radios have access to the necessary network information to avoid interference. This further illustrates how existing network operators are best positioned to harness and maximize the efficiencies that cognitive radio technologies promise. Cognitive radio technology holds the greatest promise when integrated into the network itself so that it is aware of what is happening in other parts of the network and the network can allocate spectrum use in the manner that maximizes its value. By contrast, third parties have no incentive to maximize the efficiency and value of the network as a whole.

[67] Spectrum Policy Task Force, Federal Communications Commission, Report, ET Docket No. 02-135 (Nov. 2002) ("*Spectrum Policy Task Force Report*") at 21 (stating "Flexibility provides incentives for economically efficient use and discourages economically inefficient use by ensuring that spectrum users will face the opportunity cost of their spectrum use. In most instances, the application of flexible service rules and efficient secondary market mechanisms are the best means of achieving this goal.").

[68] *See, e.g.*, *Faulhaber & Farber Declaration* at 20-22; *Katz Declaration* at ¶¶ 97-98; *Hazlett Declaration* at ¶ 39; *Spectrum Policy Task Force Report* at 57 ("The Task Force does not agree with commenters that contend that making an exclusive licensee the access 'gatekeeper' (i.e., requiring potential spectrum users to obtain licensee consent) will inhibit access by new technology. . . . If the rights afforded to licensees are sufficiently well-defined and flexible, and the secondary market mechanism is fast and efficient with low transaction costs, licensees will have ample incentive to negotiate with potential secondary users for such access").

The Commission's rules currently provide substantial flexibility for mobile wireless license holders to lease and transfer spectrum, and these marketplace-driven mechanisms are working extremely well.[69] Perhaps the best known example of innovation driven by the Commission's flexible leasing rules for mobile spectrum is Clearwire, which has announced that it is building a mobile network based principally on 2.5 GHz spectrum obtained in the secondary market through leases and transfers from Sprint Nextel and others.[70] Other mobile providers have likewise expanded and upgraded using almost exclusively spectrum obtained in secondary markets, including U.S. Cellular, Leap Wireless, and MetroPCS.[71] AT&T also has entered into arrangements under which it obtains spectrum from other carriers in areas where AT&T requires additional spectrum. As the Commission's own license records confirm, secondary market spectrum partitioning, sales and swaps have become commonplace as each competing wireless

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[69] *See, e.g., Innovation NOI* at ¶¶ 32-33; *Hazlett Declaration* at ¶ 39.

[70] *Clearwire continues broadband spectrum roadmap,* FierceBroadbandWireless (June 17, 2009), *available at* http://www.fiercebroadbandwireless.com/story/clearwire-continues-broadband-spectrum-roadmap/2009-06-17; News Release, *Clearwire, Clearwire Completes Transaction With Sprint Nextel and $3.2 Billion Investment to Launch 4G Mobile Internet Company,* (Dec. 1, 2008), *available at* http://newsroom.clearwire.com/phoenix.zhtml?c=214419&p=irol-newsArticle&ID=1231029; *McCaw Bets Again On Wireless Frontier,* Wall St. J. (Nov. 14, 2007), available at http://online.wsj.com/article/SB119498643110891751.html. *See also Hazlett Declaration* at ¶¶ 30-31.

[71] Press Release, *Leap Wireless International, Inc. and MetroPCS Communications, Inc. Enter into National Roaming Agreement and Spectrum Exchange Agreement (*Sept. 29, 2008), available at http://phx.corporate-ir.net/phoenix.zhtml?c=95536&p=irol-newsArticle&ID=1203114; Press Release, Metro PCS, *MetroPCS Signs Asset and Spectrum Purchase Agreements for Jacksonville, Florida* (Jan. 9, 2008), *available at* http://investor.metropcs.com/phoenix.zhtml?c=177745&p=irol-newsArticle&ID=1093816; *Alltel, U.S. Cellular Swap Spectrum,* Wireless Week (Feb. 28, 2007), *available at* http://www.wirelessweek.com/Archives/2005/09/Alltel,-U-S--Cellular-Swap-Spectrum/; Press Release, *Leap to Exchange Wireless Spectrum in Grand Rapids, MI for Rochester, NY* (May 15, 2006), *available at* http://phx.corporate-ir.net/phoenix.zhtml?c=95536&p=irol-newsArticle&ID=856821; Press Release, *Leap to Expand Footprint With Acquisition of Wireless Spectrum Licenses in North and South Carolina* (Mar. 13, 2006), available at http://phx.corporate-ir.net/phoenix.zhtml?c=95536&p=irol-newsArticle&ID=830727.

carrier continually re-engineers and expands its networks.[72] And the Commission's rules also provide significant flexibility to meet short term demands – for example, AT&T has leased spectrum on a short term basis in areas where it anticipated significant spikes in use, such as occurs during large sporting events and conventions.

B. The FCC Should Prioritize Allowing Market Forces To Provision Needs Efficiently

In this highly competitive market, the FCC should ensure that commercial allocations outside of the auction context are avoided where market forces can provision the needs efficiently and effectively.[73] For example, while the *Spectrum Notice* discusses mobile broadband in a different section and as a completely different segment from fixed wireless broadband, either or both services can be provisioned from mobile spectrum—as AT&T has defined above—and there is no compelling reason for the FCC to intervene and impose strict usage requirements when the market can adequately balance competing needs. To the extent that the highest and best value of a particular spectrum band at a particular time is fixed wireless broadband, a provider intending to offer that kind of service can bid for and acquire flexible use

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[72] For example, a search for "Clearwire" on the FCC's Universal Licensing System, Lease Specific Search, returned 312 active Lease IDs. *See* http://wireless2.fcc.gov/UlsApp/UlsSearch/searchLease.jsp (last checked Sept. 22, 2009). Similarly, a search of the ULS for active leases of the Educational Broadband spectrum returned 1192 active Lease IDs. *See id*. More generally, the Commission's records show that the original allocated spectrum has undergone substantial partitioning, which, although not always, is generally done to allow spectrum leasing or transfers. For example, there were originally 1,994 PCS licenses, but today, through partitioning, there are more than 3,725 PCS licenses, according to the Commission's records. *See* http://wireless.fcc.gov/uls/index.htm?job=transaction&page=weekly.

[73] AT&T recognizes that the public interest must also balance other, non-commercial, uses of the spectrum that may, for various reasons, fall outside the market model of highest and best use being expressed solely in terms of auction bids. For example, public safety spectrum and certain types of industrial uses, scientific uses, and medical uses may not be positioned to compete with commercial uses in a auction. While it may be possible to address some of those applications through commercial systems, AT&T recognizes that other uses may not be successfully provisioned through commercial spectrum.

spectrum for that purpose. If, over time, the highest value for the spectrum shifts to mobile broadband, the provider can convert the use of the band immediately. To the extent that the FCC abandons its successful flexible use policies and devotes spectrum specifically for fixed services, maintaining spectrum at its highest and best value will inevitably require FCC intervention at a later time.

The efficacy of flexible allocation policies has been illustrated time and again by the Broadband Radio Service ("BRS") and Educational Broadband Service ("EBS"), formerly the Multichannel Multipoint Distribution Service ("MMDS") and Instructional Television Fixed Service ("ITFS"). In the early days, the use of MMDS/ITFS was tightly regulated, and frequent rulemakings occurred to expand incrementally the rights of MMDS licensees.[74] In each case, however, the market in which such licensees operated moved faster, and MMDS licensees were

[74] *See, e.g.*, *Amendment of Part 74 of the Commission's Rules With Regard to the Instructional Television Fixed Serv.*, Order & Further Notice of Proposed Rulemaking, 9 FCC Rcd 3348 (1994) (streamlining ITFS application processing); *Amendment of Part 74 of the Commission's Rules Governing Use of the Frequencies in the Instructional Television Fixed Serv.*, Report & Order, 9 FCC Rcd 3360 (1994) (allowing all educational programming to be "loaded" onto a single ITFS channel, thus allowing the other three channels to be leased to the wireless operator on a full-time basis); *Amendment of Parts 0 and 1 of the Commission's Rules to Reflect a Reorganization of Multipoint & Multichannel Multipoint Dist. Serv. Regulation*, Order, 9 FCC Rcd 3661 (1994) (centralizing the processing and regulatory jurisdiction over wireless cable in the Mass Media Bureau); *Request For Declaratory Ruling on the Use of Digital Modulation by Multipoint Distribution Service and Instructional Television Fixed Service Stations*, 11 FCC Rcd 18839 (1996) (permitting use of digital modulation techniques for high speed digital data services in MDS/ITFS); *The Mass Media Bureau Implements Policy for Provision of Internet Service on MDS and Leased ITFS Frequencies,* 11 FCC Rcd 22419 (1996) (implementing declaratory ruling related to high speed services); *Request For Declaratory Ruling on the Use of Orthogonal Frequency Division Multiplexing Modulation by Multipoint Distribution Service and Instructional Television Fixed Service Stations,* 14 FCC Rcd 4121 (1999) (permitting use of OFDM by MDS/ITFS); *Amendment of Parts 21 and 74 to Enable Multipoint Distribution Service and Instructional Television Fixed Service Licensees to Engage in Fixed Two-Way Transmissions,* MM Docket No. 97-217, Report and Order, 13 FCC Rcd 19,112 (1998), recon., 14 FCC Rcd 12,764 (1999), *further recon.*, 15 FCC Rcd 14,566 (2000) (permitting two-way use of MDS/ITFS); *Amendment of Part 2 of the Commission's Rules to Allocate Spectrum Below 3 GHz for Mobile and Fixed Services to Support the Introduction of New Advanced Wireless Services, including Third Generation Wireless Systems,* First Report and Order and Memorandum Opinion and Order, ET Docket No. 00-258, 16 FCC Rcd 17,222 (2001) (permitting mobile use of MDS/ITFS).

never competitively effective. It was only after the Commission retooled MMDS in line with other allocations—rebanding MMDS into contiguous spectrum and granting flexibility to provide market based services[75]—that the service, now known as BRS/EBS, is able to exert competitive influence. Notably, the major licensee in the band, Clearwire, started by providing fixed broadband services and was, under the new flexibility policies, able to transition to provision of mobile broadband services seamlessly.[76]

C. Claims that Commercial Wireless Spectrum Can Be Shared Are Technically Invalid

In the *Spectrum Notice*, the FCC suggests that there are commenters that "have noted the low average percent of use of spectrum in some commonly used commercial bands."[77] Those commenters, however, typically favor mandatory "sharing" of licensed mobile spectrum and, to those ends, have typically asserted that there is a wealth of licensed mobile wireless spectrum lying fallow and that it can be used without causing significant interference, either through underlays or cognitive radios that can opportunistically identify and use only the fallow

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75 *Amendment of Parts 1, 21, 73, 74 and 101 of the Commission's Rules to Facilitate the Provision of Fixed and Mobile Broadband Access, Educational and Other Advanced Services in the 2150-2162 and 2500-2690 MHz Bands*, Report and Order and Further Notice of Proposed Rulemaking, 19 FCC Rcd 14165 (2004) (noting "[t]he actions taken in this order initiate a fundamental restructuring of the band that will provide both existing ITFS and MDS licensees and potential new entrants with greatly enhanced flexibility in order to encourage the highest and best use of spectrum domestically and internationally, and the growth and rapid deployment of innovative and efficient communications technologies and services").

76 *Cmp*. Press Release, *McCaw Led Clearwire Launches Commercial Wireless Broadband Services in Jacksonville* (Aug. 26, 2004), *available at* http://newsroom.clearwire.com/phoenix.zhtml?c=214419&p=irol-newsArticle&ID=1039952&highlight= *with* Press Release, *Clearwire Introduces CLEAR(TM) 4G Mobile Internet Service to Milledgeville, Georgia* (Oct. 1, 2009), *available at* http://newsroom.clearwire.com/phoenix.zhtml?c=214419&p=irol-newsArticle&ID=1337299&highlight=.

77 *Spectrum Notice* at 5.

spectrum. These arguments—and specifically the basic premise that significant commercial spectrum lies fallow—are scientifically without merit.

As an initial matter, there is no evidence that significant licensed mobile spectrum is lying fallow available for sharing. Those who claim otherwise typically point to findings in a 2003 test purporting to find fallow spectrum in the 30 MHz to 3 GHz range in Washington D.C.[78] But only a small amount of the spectrum in that range is licensed mobile spectrum, and the underlying data for that study show that the mobile cellular spectrum – in sharp contrast to unlicensed spectrum – was highly utilized.[79] A similar test in Chicago confirmed these results, showing near 100 percent fill rates of mobile spectrum in the down-link band (receiver to handset) in PCS spectrum.[80]

As extensively documented in the *AT&T CMRS Innovation Comments*,[81] even to the extent that some mobile wireless frequencies may go unused at a given place and time, mandatory sharing through underlays or opportunistic use still would be inappropriate because such sharing would cause significant interference and degradation of mobile services. Modern mobile wireless networks are increasingly sensitive to interference. The ever increasing demand for mobile wireless services and the shortage of spectrum require mobile providers to transmit

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78 *See Innovation NOI* at n.41, citing M. McHenry and M. Vilimpoc, *Dupont Circle Spectrum Utilization During Peak Hours, The New America Foundation and The Shared Spectrum Company* (2003), *available at* http://vilimpoc.org/research/policy/NAF-SSC-Spectrum-Measurement-Results.pdf.

79 *See Faulhaber & Farber Declaration* at 20-22. The underlying data show that cellular bands at 806-894 MHz had 100 percent utilization and that the PCS bands at 1850-1990 MHz had at least 64 percent use, which the authors of the study (and others) have noted significantly understate actual use because the testing equipment often could not detect the very low power signals of mobile handsets. *Id*. at 4 & App. A.

80 John T. Macdonald, *A Survey Utilization in Chicago* (Mar. 7, 2007), *available at* http://www.ece.iit.edu/~wemi/publications/spectrum.pdf. The study explains that signals for the uplink to the receiver could not accurately be measured due to their very low power use.

81 *AT&T CMRS Innovation Comments* at 75-87.

increasing amounts of data through the same amount of spectrum, and as the capacity of spectrum approaches its theoretical limits – and carriers continue to reduce the power of handsets to address congestion – so too does the sensitivity to interference.[82] Mandatory underlays also "hamper the emergence of secondary markets" by encumbering licensees' ability to lease or transfer the underlay spectrum.[83]

D. The Commission Should Continue To Rely on Proven Mechanisms for Addressing Incumbent Relocation Issues In Spectrum Reallocations

In the *Spectrum Notice*, the FCC asks for comment on the "costs of moving current occupants and users of under utilized spectrum bands to other bands, [or] to other technologies or solutions that do not require licensed spectrum."[84] Since the Emerging Technologies band was created in 1992, mobile carriers in the U.S. have developed considerable expertise in the relocation of incumbent users to free reallocated spectrum for new mobile use. In fact, the successful relocation of incumbent microwave users from the 2 GHz broadband PCS band was followed by use of the same framework at AWS to successfully transition incumbents at 2.1 GHz. AT&T urges the Commission to follow the practices in these prior allocations for repurposing of spectrum, which relies on new entrant initiated relocation negotiations with any incumbent licensees. This framework is a model that carriers and incumbents are familiar with and trust.

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82 *See also, e.g.*, CTIA Comments, *Commission Seeks Comment On Spectrum Policy Task Force Report*, ET Docket No. 02-135, at 12 (filed Jan. 27, 2003) ("CTIA Spectrum Policy Report Comments") ("[T]he Commission should recognize that, as newer technologies attempt to pack in increasing amounts of data, they may become more susceptible to noise at a particular threshold, instead of less"); *AT&T Temperature Interference Comments* at 15-17.

83 William Lehr, *The Role of Unlicensed In Spectrum Reform, in Internet Policy and Economics*, at 8 (William Lehr and Lorenzo Papillo eds. 2009).

84 *Spectrum Notice* at 6.

Similarly, while still in its infancy, the framework and process set forth in the Commercial Spectrum Enhancement Act ("CSEA") for relocation of Federal users from reallocated spectrum appears to be working in a promising manner. Recently, NTIA received comment on possible improvements to the CSEA process, since the AWS CSEA relocations in the 1.7 GHz band have been ongoing for almost two years. While AT&T supports making the process more transparent, the fundamental framework for handling Federal relocation appears sound and should continue to be the model for government relocation.

Q5. WHAT IS THE ABILITY OF CURRENT SPECTRUM ALLOCATIONS TO SUPPORT BOTH THE FIXED AND MOBILE WIRELESS BACKHAUL MARKET?

A. Existing Backhaul Infrastructure Must Accommodate the Same Growth in Data To Avoid Creating a Broadband Bottleneck

The final question in the FCC's *Spectrum Notice* is whether "current spectrum allocations [are able] to support both the fixed and mobile wireless backhaul market."[85] Given expected demand for mobile data, AT&T does not believe existing backhaul resources are capable of meeting the requirements for broad 4G availability. Even though network operators are rapidly upgrading cell sites to fiber optic backhaul, microwave will remain an important backhaul resource, and perhaps the primary resource outside of urban cores for long paths. Based upon the strong growth projected for data, AT&T believes that the FCC should undertake several measures, including setting aside additional spectrum below 10 GHz for point-to-point services, to ensure that backhaul does not become a limiting factor for broadband services. At the same time, the FCC should exercise care to promote continued investment in backhaul facilities by avoiding market-distorting regulations on special access rates.

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[85] *Id*. at 7.

The *Spectrum Notice* observes that "commenters in various proceedings have noted a pressing need for additional cost-effective backhaul capacity for both wired and wireless networks,"[86] and therefore poses a number of questions related to the supply of backhaul spectrum. As an initial matter, it should be self-evident that the demand for wireless capacity results in a commensurate loading of backhaul facilities; to the extent that mobile spectrum must accommodate a CAGR of 130 percent, cell sites in the network must also be capable of backhauling that additional data to switching facilities or the Internet. At present, 80 to 90 percent of all wireless cell sites are served by legacy copper T1s that will not support 4G data needs.[87] "[W]ith [the move to] LTE and some of the other technologies," however, "T1s are out."[88] There is simply no way that copper T1s can support the huge increases in wireless traffic that are already under way.[89] Indeed, virtually all wireless carriers are currently mounting major

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86 *Id*.

87 *See* Hunter Newby, Chief Executive Officer, Allied Fiber, Remarks at the FCC Broadband Workshop (Deployment/Wired – General) at 23 (Aug. 12, 2009) ("There is less than 10 percent of the towers in the U.S. have fiber"), *available at* http://www.broadband.gov/docs/ws_02_deploy_wired_transcript.pdf; David Armentrout, President and Chief Executive Officer, FiberNet, Remarks at the FCC Broadband Workshop (Deployment/Wired – General) at 45 (Aug. 12, 2009) , *available at* http://www.broadband.gov/docs/ws_02_deploy_wired_transcript.pdf ("*Armentrout Testimony*") (stating "the majority of the towers in our markets are T1-fed today"); Tom Swanobori, Tom Sawanobori, Vice President of Network and Technology Strategy, Verizon, Remarks at the FCC Broadband Workshop (Deployment/Wireless - General) at 44 (Aug. 12, 2009), *available at* http://www.broadband.gov/docs/ws_03_deploy_wireless_transcript.pdf ("regarding the number of cell sites with fiber backhaul, "it might be even less than that [10 percent]"); *see also* Yankee Group 4G Network Backhaul Summit, Powerpoint Presentation of John Saw, CTO Clearwire, at 4 (Sept. 15, 2009) (">80% of US cell sites are still fed with copper based TDM circuits"); Yankee Group, *Mobile Backhaul: Will the Levees Hold?,* Anchor Report, at 6, June 2009 (chart showing between 85 and 90 percent of backhaul comes from leased T1s or E1s).

88 *Armentrout Testimony* at 45.

89 *See* Craig E. Moffett, Vice President and Senior Analyst, U.S. Telecommunications, Cable and Satellite, Sanford Bernstein, Remarks at the FCC Broadband Workshop (Deployment/Wired – General) at 25-26 (Aug. 12, 2009), *available at* http://www.broadband.gov/docs/ws_02_deploy_wired_transcript.pdf ("the 4G plan obviously carries with it an expectation of providing more than T1s in and out of the towers. . . . It's a foregone conclusion you're going to have to bring fiber [to towers as you're planning LTE]");

campaigns to upgrade backhaul facilities to fiber where possible and where it is a workable economic choice.[90]

For backhaul within urban and suburban centers, wireless providers have acknowledged that they have plentiful competitive alternatives for backhaul. For example, T-Mobile testified that "competitive forces work in metro areas where there's lots of fiber, be that from the utility company, from the cable company, from the existing, you know, telco provider. So, I think market forces are starting to work there."[91] Indeed, competitive providers have acknowledged that they are making major investments to compete in the supply of wireless backhaul. For example, Cox has stated that "the network that we're building today is all IP-connected to every cell site that we're deploying, and within the market that we're building, we're essentially

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Yankee Group, *The Inevitable Transformation of the Mobile Internet*, Anchor Report, at 3 (April 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"); Yankee Group, *Mobile Backhaul: Will the Levees Hold*?, Anchor Report at 4 (June 2009) (in 2008 there were 228,000 cell sites served by between 5 Mbps and 10Mbps of backhaul capacity, on average; "[b]y 2012, we expect to see more than 300,000 cell sites in the U.S., each supporting between 50 Mbps and 100 Mbps in backhaul capacity. . . . If we were to keep throwing T1s at the problem, this would result in a backhaul bill of $82 billion by 2012 and the monthly average cost per site would be about $23,000 compared to today's average of $2,100"); Yankee Group 4G Network Backhaul Summit, Powerpoint Presentation of Dan Graf, Leap Wireless, at 4 (Sept. 15, 2009) ("4G will require bandwidth that current TDM networks cannot provide economically").

[90] *See* Neville Ray, Senior Vice President Engineering, T-Mobile USA, Remarks at the FCC Broadband Workshop (Deployment/Wireless – General) at 69 (Aug. 12, 2009), *available at* http://www.broadband.gov/docs/ws_03_deploy_wireless_transcript.pdf ("*Ray (T-Mobile) Testimony*") ("the T-Mobile plan is to get fiber to everything we can because we think that future-proofs the network and moves us into a cost structure very early on which enables us to grow our customer base"); Jake Macleod, Principal Vice President and Chief Technology Officer, Bechtel Telecom, Remarks at the FCC Broadband Workshot (Deployment/Wireless – General) at 47 (Aug. 12, 2009) , *available at* http://www.broadband.gov/docs/ws_03_deploy_wireless_transcript.pdf ("the ultimate solution is fiber to the cell site. If you look at some of the foreign countries we deal with a lot, they're north of 90 percent fiber to the cell sites") ("*Macleod (Bechtel) Testimony*"); Yankee Group 4G Network Backhaul Summit, Powerpoint Presentation of CFN Services, at 4 (Sept. 15, 2009) ("ILECs and MSOs are aggressively building out the fiber infrastructure; Verizon (ILEC) will have fiber to 80%+ of all sites in region by 2012; AT&T (ILEC) has fiber deployed or planned to most high capacity sites; . . . CLECs, Utilities, and other Alternative Access Vendors, More limited fiber footprint than incumbents but better economics").

[91] *Ray (T-Mobile) Testimony* at 45-46.

connecting most of the cell sites with fiber, but there are the odd exception even with our infrastructure where we would use microwave to pick up a couple of the cell sites."[92] FiberTower has claimed that it "operates a 100 percent facilities-based communications network using fiber optic and wireless assets" that "spans more than 6,000 base stations in 13 United States markets" and that "the top eight mobile carriers" are "among FiberTower's largest customers."[93] As detailed in other filings, every major cable operator (Comcast, Cablevision, Time Warner, and Cox), at least six fixed wireless providers, and at least a dozen other competitive suppliers are all aggressively targeting wireless backhaul opportunities in areas throughout the country.[94]

B. The Availability of Sufficient Long Haul Microwave Will Be Critical To Ensuring the Availability of Backhaul for Rural Areas

While many competitive options exist for "intra-urban" transport, options for backhauling remote, rural cell sites to switching centers in the urban cores are more limited. For these applications, long haul 6 GHz microwave is still the preferred solution. T-Mobile noted,

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92 Stephen Bye, Vice President of Wireless, Cox Communications, Remarks at FCC Broadband Workshop (Deployment/Wireless – General), at 49 (Aug. 12, 2009), *available at* http://www.broadband.gov/docs/ws_03_deploy_wireless_transcript.pdf.

93 Comments of FiberTower Corp., *A National Broadband Plan for Our Future*, GN Docket No. 09-51, at 3 (filed June 8, 2009); *see also* 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), *available at* 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.").

94 Patrick Brogan & Evan Leo, *High-Capacity Services: Abundant, Affordable, and Evolving*, at 34-38 (July 2009), attached to Letter from Glenn Reynolds, USTelecom, to Marlene Dortch, FCC, WC Docket No. 05-25, GN Docket No. 09-51 (FCC filed July 16, 2009).

for example, that in rural areas, "there are good microwave solutions, . . . and some carriers are totally deploying their back haul solutions on a microwave basis."[95] Sprint has likewise stated that, with respect to its Clearwire WiMax network, it "will use self-provisioned microwave backhaul to handle the high-bandwidth requirements associated with 4G applications to the maximum extent possible."[96] In a recent presentation touting the benefits of that approach, Clearwire emphasized that "90 [percent] of Clearwire cell sites use microwave backhaul."[97]

While the existing 6 GHz band currently shows considerable congestion in some areas and less in others, AT&T believes the Commission should act now to ensure the continued availability of microwave for these types of long paths. As shown in the table below, the 6 GHz band is home to path lengths that are simply not achievable in many higher microwave bands where greater spectrum availability exists:

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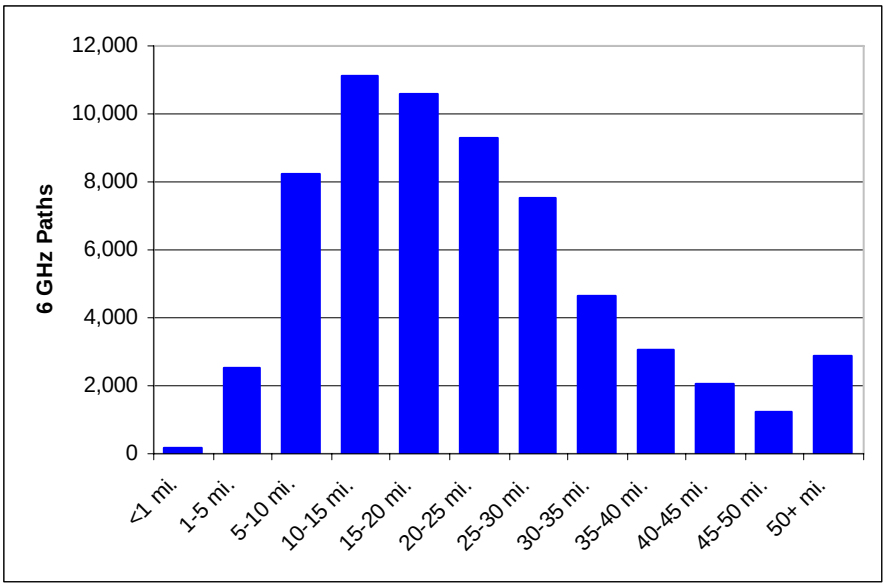
95 *Id*. at 46.

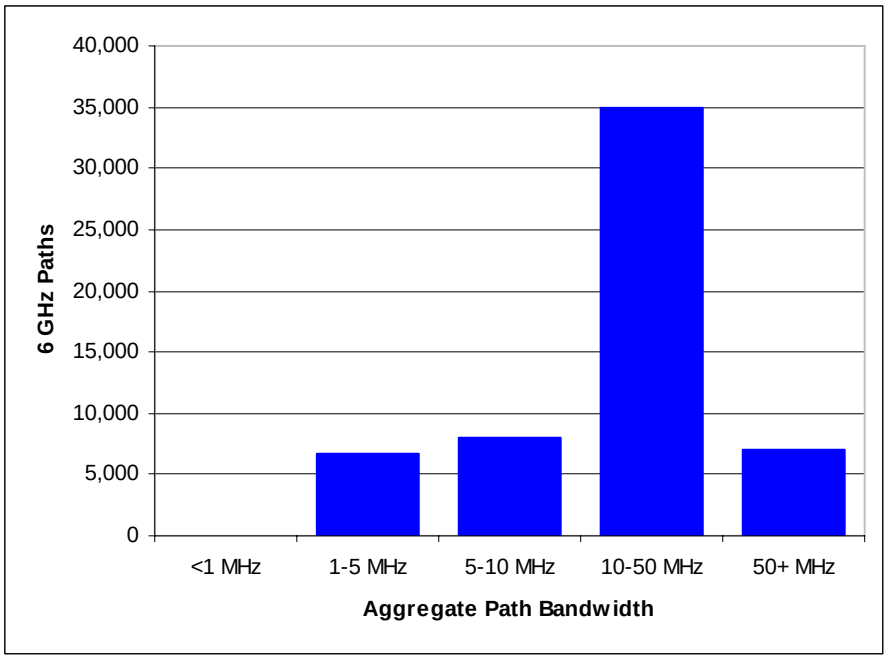
96 Sprint Comments in GN Docket No. 09-51, at 5; *see also* Yankee Group, 4G Network Backhaul Summit, at 14 (Sept. 15, 2009) (presentation of John Saw, CTO, Clearwire) ("90% of Clearwire cell sites use microwave backhaul," and there is "[t]remendous scalability," with "50 Mbps – 1 Gbps of backhaul capacity per site").

97 Yankee Group, 4G Network Backhaul Summit, at 14 (Sept. 15, 2009) (presentation of John Saw, CTO, Clearwire).



As AT&T has previously noted, backhaul capacity must grow at the same rate that data capacity needs grow, and this growth rate is phenomenal. In addition, as data requirements grow, the capacity of individual links must also grow—as shown in the table below, which shows the distribution of 6 GHz capacity between points for licenses issued, carriers routinely now require 30 MHz or even 50 MHz paths to backhaul data from particular sites:[98]

[98] Data from ULS database, showing distribution of licensed microwave capacity on individual paths, aggregating capacity from multiple transmitters on a path where applicable. While the distribution does not show historical trending, it does graphically illustrate the fact that microwave needs have changed considerably since the initial allocation of the band.



Very few 30 MHz license pairs in the 6 GHz band are available[99] and, while waivers are granted to permit 30 MHz operation on channels not designated for those bandwidths, it should be self-evident that as more links are transitioned to high capacity links, band congestion can rapidly expand to areas where capacity is currently adequate.[100]

Based upon the projected backhaul needs to support 4G services, the FCC should begin the process of evaluating additional options for point-to-point, long haul microwave. With the

[99] The FCC rules provide only 8 channel pairs for 30 MHz operation in the 5925-6425 MHz band, see 47 C.F.R. §101.147(i)(8) and no 30 MHz channel pairs in the 6525-6875 MHz band, see 47 C.F.R. §101.147(j)(3). While carriers may be granted waivers to operate 30 MHz bandwidth channels on channel pairs designated for smaller bandwidths in the Upper 6 GHz Band, or obtain multiple licenses with multiple channels for the same path, this is not be the most efficient way of providing for such capacity needs.

[100] In recognition of the need for more 30 MHz channel pairs, the Commission has recently launched a rule making proceeding proposing to allow more 30 MHz channel pairs in the 6 GHz band. *Amendment of Part 101 of the Commission's Rules to Accommodate 30 Megahertz Channels in the 6525-6875 MHz Band, Amendment of Part 101 of the Commission's Rules to Provide for Conditional Authorization on Additional Channels in the 21.8-22.0 GHz and 23.0-23.2 GHz Band, Fixed Wireless Communications Coalition Request for Waiver*, Notice of Proposed Rulemaking and Order, FCC 09-58 (2009).

exception of possible reclamation of the 4 GHz band for point-to-point use,[101] allocations for point-to-point microwave should be above the 4 GHz limit noted in Section Q2 above for mobility applications, but the allocations should also be below 10 GHz to address the need for long path lengths. In this regard, AT&T notes that point-to-point microwave is a very efficient use of spectrum; at present, the 6 GHz microwave band is home to over 32,000 active licenses comprising over 78,000 unique frequency/path combinations. As discussed before, it also represents a unique allocation in that the average path length is extremely long—over 22 miles. Accordingly, additional capacity for a similar allocation should be considered.

C. The Commission Should Refrain from Regulations that Would Distort the Market for Competitive Backhaul By Regulating Special Access Rates

Given the increases in projected demand for backhaul, the Commission should also avoid regulations that would deter investment in backhaul facilities. There is widespread agreement that rapidly rising demand for wireless broadband is driving wireless carriers from primarily copper-based backhaul services to new connections using fiber and fixed wireless technologies.[102] Cable companies and fixed wireless providers have both acknowledged that this creates significant new opportunities for them.[103] T-Mobile has testified that, looking at its "3G

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[101] While the ITU has recently examined spectrum in the 3.4-4.2 GHz band for mobile wireless services, some of this spectrum could also be used for fixed services. *See* News Release, International Telecommunications Union, *available at* http://www.itu.int/newsroom/wrc/2007/chairman-review.html. *See also AT&T CMRS Innovation Comments* at 70.

[102] *See, e.g., Evans (Stelera) Testimony* at 37 (stating "we aggregate through microwave back to a single long-haul Ethernet connection"); *Macleod (Bechtel) Testimony* at 46 ("Obviously, a lot of the carriers now are moving to Ethernet, and wireless is definitely a solution").

[103] *See, e.g.*, Dallas Clement, EVP and Chief Strategy and Product Officer, Cox Communications, Remarks at the FCC Broadband Workshop (Deployment/Wired – General) at 35 (Aug. 12, 2009), *available at* http://www.broadband.gov/docs/ws_02_deploy_wired_transcript.pdf) ("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

footprint today, we are certainly moving to, you know, a fiber backhaul solution environment."[104] One analyst projected that the U.S. backhaul services market will expand from approximately $3 billion annually today to $8 billion to $10 billion in the next two-to-four years.[105] The Yankee Group projects that wireless backhaul capacity requirements will increase 28-fold between 2008 and 2112.[106] Competitors plainly will have enormous opportunities to supply this growing segment.

Given this broad and rapidly increasing competition and the widely acknowledged need for more investment in high capacity backhaul infrastructure, it would be a mistake of the highest order for the Commission to impose further regulation on special access services. Artificially reducing special access rates would minimize the incentive to invest in new backhaul facilities by reducing the returns that any competitor could expect from the deployment of next-generation infrastructure. As Sprint's own Chief Technology Officer has acknowledged, the only reason alternative high-capacity technologies such as fixed wireless are not already as prevalent in the United States as in the rest of the world is that "relatively abundant and inexpensive T-1 lines

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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."); Q4 2008 Clearwire Corporation Earnings Conference Call – Final, FD (Fair Disclosure) Wire, Transcript 030509a2078472.772 (Mar. 5, 2009) (Clearwire Corp. COO Perry Satterlee noted the company's "pioneering use of almost exclusively microwave backhaul" and "negligible" operating costs); Tower Cloud, Overview, http://www.towercloud.com/company.shtml ("With the roll-out of 3G and 4G wireless as well as the escalation in widespread adoption of mobile data services, . . . there is an urgent need to upgrade … backhaul networks. Tower Cloud specializes in solving these network challenges to enable wireless operators to raise the business performance and quality of their networks while reducing unit costs.").

104 *Ray (T-Mobile) Testimony* at at 45.

105 *See* Frank Louthan *et al*., Raymond James & Associates, *Examining the Convergence of the Telecom and Cable Sectors*, at 16 (Aug. 18, 2008).

106 *See* Jennifer Pigg, Yankee Group, *Mobile Backhaul: Will the Levees Hold?* (June 2009) at 3 ("Yankee Group forecasts that mobile traffic will have a CAGR of 130 percent from 2008 through 2012 – that is, 1 MB of traffic in 2008 will equal 28 MB of traffic in 2012.").

have stifled the technology here."[107] Ericsson has likewise stated that "'[i]n the U.S. the ability to lease T1s has retarded microwave; it's always been less expensive to lease T1s.'"[108]

The Commission should take these comments to heart. Particularly in these economic times, the Commission's core mission should be to eliminate barriers to competitive supply and the investment that goes along with it. In this context, that means ensuring that competitive providers have an incentive to act on the enormous opportunities to supply the wireless backhaul that will be necessary to support providers' next-generation networks and consumers' ever-increasing appetite for wireless broadband.

CONCLUSION

The widespread use of mobile broadband has tremendous potential to reshape the way that consumers can communicate, seek entertainment, and conduct business, Recent experience with the meteoric uptake in data clearly demonstrates that, with better networks, devices and software, Americans will eagerly adopt mobile broadband technologies. To ensure this virtuous cycle continues, AT&T fully concurs with the FCC that additional spectrum must be a critical

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

[108] Anne Morris, *Microwave To Retain Key Role in Wireless Backhaul, As Fibre Waits in Wings*, Total Telecom (Sept. 2, 2009) (quoting Don McCullough, Ericsson).

priority for the FCC. AT&T looks forward to continuing to work with the FCC, and NTIA, to meet the needs of subscribers in the world of 4G services and offerings.

Respectfully submitted,

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