

September 29, 2009

Chairman Julius Genachowski
Commissioner Michael J. Copps
Commissioner Robert M. McDowell
Commissioner Mignon Clyburn
Commissioner Meredith Attwell Baker
Federal Communications Commission
445 12th Street, SW
12th Street Lobby, TW-A325
Washington, D.C. 20554

Re: *Written Ex Parte Communication*, GN Docket No. 09-51.

Dear Chairman Genachowski, and Commissioners Copps, McDowell, Clyburn, and Baker:

As the Commission moves forward with the development of a National Broadband Plan, CTIA – The Wireless Association® (“CTIA”) urges the Commission to use this historic opportunity to make a bold commitment to our nation’s mobile broadband future. Specifically, CTIA urges the Commission to commit to identifying and allocating a significant amount of spectrum – with a goal of at least 800 MHz – for licensed commercial wireless services. While it is impossible to quantify precisely what amount of additional spectrum would be “future proof,” such an allocation would be an important step towards meeting rapidly accelerating demand and maintaining U.S. leadership in the global mobile broadband marketplace.

Today, U.S. consumers and businesses are experiencing the first returns on the wireless industry’s massive investment in our burgeoning mobile broadband market. That investment has enabled consumers to harness two major technology trends: the ability to take their communications services with them wherever they go as a result of mobile wireless services and the ability to access almost any information they want to receive as a result of high-speed Internet access. This convergence of mobile wireless services and high-speed Internet access has put us at the dawn of a truly mobile broadband economy and way of life.

No longer can, nor should, the government focus on a third pipe to the home. Commercial wireless is providing a third, fourth, fifth, sixth, and sometimes tenth broadband pipe to the person. Yet, alarmingly, there is a looming spectrum crisis for U.S. consumers and businesses, which are rapidly embracing and increasingly dependent on this “wherever, whenever” access. A confluence of market trends has the potential to thwart the full promise of the mobile broadband future. Without swift and bold action by U.S. policymakers to free up a critical national resource – our nation’s airwaves – consumers and businesses in this country will find themselves unable to reap the full benefits of the mobile broadband age. Instead, businesses will find themselves without the tools to compete in a global marketplace and the U.S. will find itself less able to harness the many externalities of high-bandwidth mobile services that are literally transforming almost all aspects of the way we work, learn, get health care, and safeguard our public safety.

With this filing, CTIA provides further evidence that identifying and allocating significant amounts of additional spectrum for licensed commercial wireless services is imperative if U.S. providers are to continue to lead the wireless world by expanding wireless networks and services to meet rapidly expanding consumer demand. To this end, CTIA is submitting a recent report *Mobile Broadband Spectrum Demand*, developed by Rysavy Research, which summarizes the market forces behind the growth of mobile broadband services and presents a quantitative analysis of the need for additional spectrum.¹ As described in the attachment, market forces – including increasing mass market adoption, surging use of smartphones, development of high-bandwidth intensive applications, innovative pricing, and fixed-mobile substitution and convergence – are combining to produce a virtuous cycle of innovation throughout the wireless ecosystem. In addition, the *Mobile Broadband Spectrum Demand* report sets forth quantitative analyses for examining our nation’s spectrum needs and concludes that “significant amounts of additional licensed spectrum will be imperative for expanding networks towards a ubiquitous mobile Internet.”

Although it is difficult to predict exactly how much spectrum will be needed, this filing also sets forth important benchmarks for U.S. policymakers to consider. First, CTIA presents a valuable international perspective on the spectrum planning of our global competitors, who are actively preparing for a mobile broadband future by allocating significantly more spectrum for commercial wireless services than the United States. Second, this paper highlights the detailed analysis of the International Telecommunications Union in estimating spectrum bandwidth requirements for 2010, 2015, and 2020.

Based on these analyses, it is apparent that policymakers must launch a major effort to identify and allocate sufficient spectrum for commercial mobile broadband use. To meet this challenge, U.S. policy makers should adopt a dual approach. First, U.S. policymakers should launch an effort to identify and allocate at least 800 MHz of additional spectrum for licensed commercial wireless use within the next six years. Recognizing the long lead times necessary to achieve such major spectrum allocations, this process should begin immediately. Second, policymakers should work to meet short-term needs by pairing and allocating readily-available spectrum in the 1755-1780 MHz and 2155-2180 MHz bands for licensed commercial wireless use as quickly as possible.

In this filing, CTIA highlights the following critical points for assessing our commercial wireless spectrum needs:

- **The ITU has estimated that commercial wireless will need an allocation of 1,300 MHz by 2015 – meaning an additional 800 MHz of spectrum in the U.S. – in order to meet surging demand of mobile broadband services.**
- **56% of Americans have accessed the Internet by wireless means.**
- **Mobile wireless broadband growth continues to outpace every other broadband platform, with net additions greater than those of DSL and cable modem combined.**
- **Pew estimates that, by 2020, mobile devices will be the primary Internet devices for most people in the world.**

¹ *Mobile Broadband Spectrum Demand*, Rysavy Research (Dec. 2008) (<http://www.rysavy.com/aboutus.html>).

- **Bandwidth-intensive applications driving mass-market adoption of mobile broadband include highly sought after consumer and business applications such as mobile video, social networking, enterprise productivity, user-generated content, instant messaging, location-based services, and Web 2.0 applications.**
- **Watching a YouTube video consumes 100 times the bandwidth of a voice call.**
- **Estimates place the mobile data traffic footprint of a single mobile subscriber in 2015 at 450 times what it was in 2005.**
- **The Rysavy paper concludes that “several users within the same cell sector engaging simultaneously in high throughput applications (e.g., video streamlining) can quickly strain the network impacting the user experience for every consumer accessing the network, even if they are not themselves engaging in bandwidth-intensive activities.”**
- **The Rysavy paper also finds that “it is unlikely that operators will be able to deliver satisfactory service in the future at these high traffic volumes using existing spectrum.”**
- **Our global competitors have launched commercial wireless spectrum deployment plans that outstrip U.S. resources literally by hundreds of MHz.**

We believe the facts and analyses included in this filing provide a solid basis for the Commission to make a much-needed national commitment towards global mobile broadband leadership by identifying and allocating significant additional spectrum for commercial wireless usage through the National Broadband Plan. If you have any questions, please do not hesitate to contact me.

Sincerely,

/s/ Christopher Guttman-McCabe
 Christopher Guttman-McCabe
 Vice President, Regulatory Affairs
 CTIA – The Wireless Association®

Attachments

1. *Ex Parte* Letter – The Wireless Crisis Foretold: The Gathering Spectrum Storm...and Looming Spectrum Drought
2. *Mobile Broadband Spectrum Demand*, Rysavy Research (Dec. 2008)

Wireless Crisis Foretold:

The Gathering Spectrum Storm... and Looming Spectrum Drought

September 2009

The Makings of a Perfect Wireless Storm

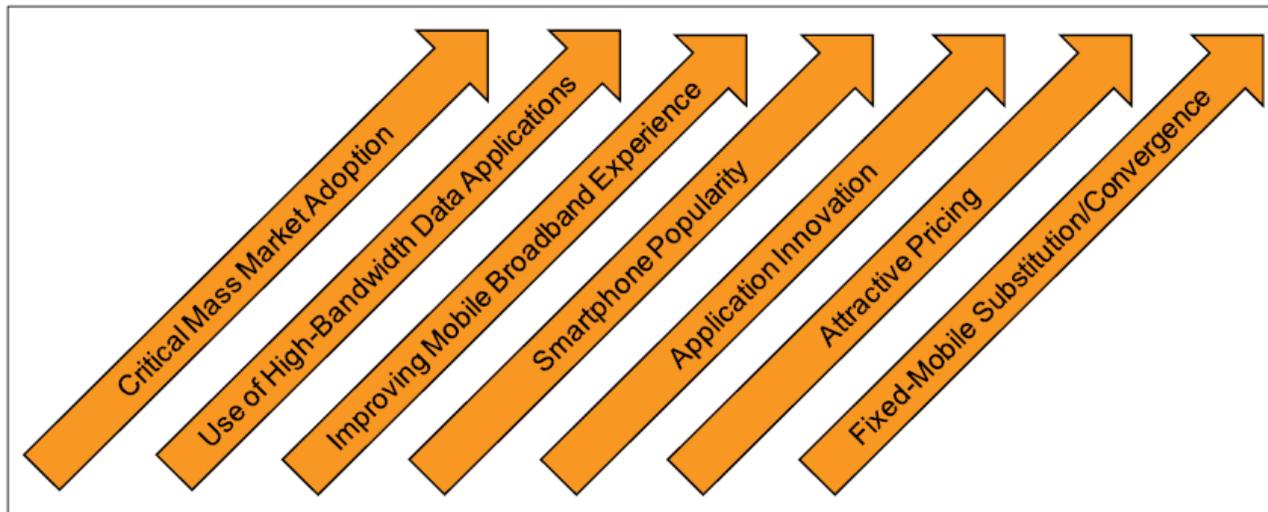
With this filing, CTIA – The Wireless Association® (“CTIA”) provides further evidence that U.S. policymakers must immediately launch an effort to identify and allocate significant amounts of additional spectrum for commercial wireless services if the U.S. wants mobile providers to continue expanding their wireless networks and services to meet rapidly expanding demand. CTIA urges the Commission to consider the findings of the *Mobile Broadband Spectrum Demand* report, developed by Rysavy Research.² The *Mobile Broadband Spectrum Demand* report summarizes the market forces behind the growth of mobile broadband services and presents a quantitative analysis of the need for additional spectrum. The report also sets out a dual approach for analyzing our nation’s spectrum needs and concludes that “significant amounts of additional licensed spectrum will be imperative for expanding networks towards a ubiquitous mobile Internet.”

The *Mobile Broadband Spectrum Demand* report provides a constructive framework for analyzing the trends and factors that are coalescing to form a perfect storm for wireless broadband demand and raising the specter of an imminent spectrum drought for U.S. consumers and businesses. As outlined in the report, a number of major factors – including increasing mass market adoption, surging use of smartphones, development of high-bandwidth intensive applications, innovative pricing, and fixed-mobile substitution and convergence – are combining with multiplicative effect to accelerate the usage of spectrum-based services.

Together these market forces are creating a virtuous cycle of innovations. As Rysavy describes it: “[w]e are witnessing the culmination of massive network investment, technology innovation and development, spectrum deployment, and user sophistication.” We describe below the key factors that are driving mobile broadband usage and that will directly translate into greater spectrum needs.

² *Mobile Broadband Spectrum Demand*, Rysavy Research (Dec. 2008).

Market Factors Behind Growing Wireless Usage



Source: *Mobile Broadband Spectrum Demand* at 6.

Mass Market Adoption. One of the most pronounced indicators of the looming spectrum crisis is the critical mass of consumers who are adopting wireless broadband services. While estimates of the mobile broadband market exhibit some variation, all sources suggest rapid mass market adoption. According to the *Mobile Broadband Spectrum Demand* report, the number of active mobile Internet users has doubled in the past two years to over 40 million users.³ Other sources confirm this soaring adoption of mobile Internet services:

- **According to the Pew Internet & American Life Project, 56% of Americans have accessed the Internet by wireless means.⁴**
- **Similarly, Pew found that 32% of all Americans have gone online with a cell phone or other handheld device.⁵**
- **According to the FCC's most recent data, there were over 59 million mobile wireless high speed lines.⁶**
- **In addition, mobile wireless broadband growth continues to outpace every other broadband platform, with net additions between December 2007 and June 2008 greater than those of DSL and cable modem combined.⁷**

³ *Mobile Broadband Spectrum Demand* at 6.

⁴ *Wireless Internet Use*, Pew Internet & American Life Project, at 3 (July 2009) (“2009 Pew Wireless Internet Use”).

⁵ *2009 Pew Wireless Internet Use* at 3.

⁶ *High-Speed Services for Internet Access: Status as of June 30, 2008*, Federal Communications Commission, at Tbl. 1 (July 2009) (“June 2008 FCC High-Speed Services Report”).

⁷ *2008 FCC High-Speed Services Report* at Tbl. 1.

The rapid and widespread adoption of mobile broadband services is a broad trend that holds true over a variety of demographics. Mobile wireless broadband is proving to be more rapidly adopted and used in communities that have traditionally trailed in broadband adoption, such as low-income and minority consumers. For example, African Americans are the most active users of the mobile Internet, with 29 percent of African Americans and 29 percent of Hispanics reporting that they use the Internet on their handheld devices *on a typical day*.⁸ These trends are even more pronounced among younger Americans. Of those in the 18-29 age group, 93 percent reported using a cell phone or personal data assistant to access the Internet, send or receive text messages, get a map or directions, send or receive email or instant messages, record or watch video, take pictures, or play music or a game.⁹ Given these trends among younger users, it is no surprise that Pew also has predicted that:

- **By 2020, mobile devices will be the primary Internet devices for most people in the world.**¹⁰

Indeed, the vision foreseen in Pew's survey of experts is one in which "the mobile phone—now with significant computing power—is the primary Internet connection and the only one for a majority of the people across the world, providing information in a portable, well-connected form at a relatively low price."¹¹ As the Rysavy report posits, this expanding customer base will encourage business investment in new networks, new devices, and in new applications. This does not even attempt to capture the potential growth of mobile-to-mobile uses. Nonetheless, the rapid growth in mobile Internet adoption in the mass market – as demonstrated over the past few years and as anticipated in the near future – portends of the gathering wireless storm.

Networks Are Delivering Increasingly Rich Broadband Experiences. Another critical factor in analyzing spectrum needs is the continued evolution of wireless networks. In particular, the deployment of third generation ("3G") mobile broadband technologies is providing an increasingly rich broadband experience for mobile wireless users.¹²

As CTIA has previously demonstrated, service providers are continuously investing to expand and upgrade their networks.¹³ Over the past several years these investments have facilitated deployment of high-speed networks that reach more than 234 million Americans consumers. 3G broadband technologies EV-DO Rev. A and HSPA offer average download speeds between 400-600 kbps (or more) and burst speeds up to 1.6 Mbps. For example, T-Mobile just launched in Philadelphia the newest version of HSPA, HSPA+, that can deliver up to 21 Mbps. More high-speed facilities are being deployed every day, and providers are transitioning to Fourth Generation ("4G") technology (generally LTE or WiMAX) with downlink speeds approaching 40 Mbps for WiMax and 100 Mbps for LTE.

⁸ 2009 Pew Wireless Internet Use at 18.

⁹ 2009 Pew Wireless Internet Use at 26.

¹⁰ *The Future of the Internet III*, Pew Internet & American Life Project, at 5 (Dec. 2008) ("*The Future of the Internet III*").

¹¹ *The Future of the Internet III* at 5.

¹² *Mobile Broadband Spectrum Demand* at 7.

¹³ See generally Letter from Christopher Guttman-McCabe, Vice President, Regulatory Affairs, CTIA, to Julius Genachowski, Chairman, Federal Communications Commission, *et al*, GN Docket No. 09-51, *et al* (filed July 9, 2009) ("*Wireless Economic Contributions Ex Parte*").

Wireless carriers' massive network investments are critical. Without them, networks are at risk of becoming overloaded, with slower and more erratic throughput speeds, packet delays, and unreliable application behavior. As a direct result of wireless carrier investments, U.S. consumers are benefiting from a "more satisfying broadband experience in which applications are fast and responsive" which in turn encourages more subscriber usage.¹⁴

These 3G networks are supporting a wider range of business and consumer applications and users are significantly more likely to engage in more data sessions.¹⁵ As the Rysavy research shows, mobile data usage has moved beyond text and instant messages and email to now include a host of activities including "Internet Web access, worker collaboration, enterprise database access, multimedia such as video, gaming, mobile commerce, connected consumer services (e.g., Apple iTunes, Amazon Unbox), and social networking."¹⁶ With all the additional capabilities of 3G networks, it is not surprising that 3G users are significantly more likely to engage in a higher number of data sessions than 2G users.¹⁷

Surging Use of Smartphones. As described in the Rysavy paper, the use of smartphones, which combine computer and Internet capability, is surging. Handsets are becoming tools of productivity and gateways to information in ways that are evolving every day. The explosion of the smartphone platform has enabled consumers to get access to mobile technology that had previously only seen major penetration in the business marketplace.

As the following graphic illustrates, smartphones are now multi-function devices that give consumers access to whatever information they want, wherever and whenever they want it:



¹⁴ *Mobile Broadband Spectrum Demand* at 7.

¹⁵ *Mobile Broadband Spectrum Demand* at 7.

¹⁶ *Mobile Broadband Spectrum Demand* at 7.

¹⁷ *Mobile Data: The Engine Behind Wireless*, Lehman Brothers Equity Research at 4 (Apr. 2008).

- **23 percent of the wireless handsets sold in the U.S. were smartphones, during both the fourth quarter of 2008 and first quarter of 2009.¹⁸**

The rapid adoption of smartphones has been triggered by numerous factors, but the expansion of 3G networks boosts their value and functionality. In addition, with rising volumes and economies of scale, Rysavy notes that smartphones are becoming more affordable in many instances. Notably, the innovation in smartphones is being felt in the U.S. first as a result of our robust marketplace. In the last 18 months, many of the most advanced handsets have been launched in the U.S.

As with 3G users, consumers with smartphones are far greater users of mobile data applications than other wireless consumers. As the following chart illustrates, even as early as January 2008, smartphone users have exhibited extraordinary consumption of mobile content as compared to market usage standards:

Smartphone Usage

Mobile Content Consumption: iPhone, Smartphone and Total Market: January '08			
Activity	iPhone	Smartphone	Market
Any news or info via browser	84.8%	58.2%	13.1%
Accessed web search	58.6%	37.0%	6.1%
Watched mobile TV and/or video	30.9%	14.2%	4.6%
Watched on-demand video or TV programming	20.9%	7.0%	1.4%
Accessed Social Networking Site or Blog	49.7%	19.4%	4.2%
Listened to music on mobile phone	74.1%	27.9%	6.7%

Source: *Mobile Data: The Engine Behind Wireless* at 8.

Another indicia of this increasing mobile broadband usage comes from recently reported statistics on mobile uploads to YouTube. According to YouTube’s blog, mobile uploads to YouTube have increased 1700 percent in the last six months and increased more than 400 percent per day in the week following the launch of the iPhone 3GS.¹⁹

As a recent CNNMoney article described it, “smartphones are double-edged swords for phone operators ... [they] tax networks designed for simpler times. Now the wireless providers hawking those Internet-enabled mobile devices are experiencing the digital equivalent of being proprietors of an all-you-can-eat buffet. It seems like the perfect business until the sumo wrestlers show up.”²⁰

Beyond smartphones, advances in mobile wireless broadband access technologies are making mobile broadband accessible by more devices. Wireless data cards are bringing direct access to mobile broadband to laptop computers, computer manufacturers and wireless providers are offering computers with embedded mobile broadband capabilities, and mobile wireless

¹⁸ http://www.npd.com/press/releases/press_090303.html. [Add cite for 1Q 2009]

¹⁹ Posting by Dwipal Desai, Product Manager, and Mia Quagliarello, Community Manager to YouTube Blog, “Mobile Uploads to YouTube Increase Exponentially,” http://youtube-global.blogspot.com/2009/06/mobile-uploads-to-youtube-increase_5122.html (June 25, 2009).

²⁰ “Bandwidth Hogs -- iPhone and Other Smartphones,” CNNMoney (Aug. 28, 2009).

hotspots provide connectivity to Wi-Fi enabled equipment over mobile broadband networks. The end result of this innovation is better access to data over mobile broadband networks.

Use of High-Bandwidth Data Applications. One of the most pronounced trends in wireless usage patterns is the shift in traffic from voice to wireless data applications. Until recently, the applications that did exist for mobile phones largely consisted of ringtones and basic arcade-style games. Cell phones did not have the processing capacity, display capability, memory, and connectivity necessary to create the experience most users were accustomed to on their personal or workplace computers. But the appeal of mobility and the development of advanced devices and smartphones have resulted in tremendous innovation and investment in the applications space over the past two years.

The *Mobile Broadband Spectrum Demand* paper provides an early view into consumers' adoption of increasingly bandwidth-intensive applications, noting:

- **The simple task of watching a YouTube video consumes 100 times the bandwidth of a voice call.**
- **Downloading a 5 MB Microsoft PowerPoint file to view it on a phone or laptop consumes the same amount of data on the downlink as speaking on a phone for more than an hour.**

The following table sets out a number of current mobile applications and their bandwidth requirements:

Application Bandwidth Requirements

Application	Bandwidth
Mobile voice call	6 kbps to 12 kbps
Low-quality music stream	28.8 kbps
Medium-quality music stream	128 kbps
High-quality music stream	300 kbps
Video conferencing	384 kbps to 3 Mbps
Entry-level, high-speed Internet	1 Mbps
Internet streaming video	1 Mbps
Telecommuting	1 to 5 Mbps
Gaming	1 to 10 Mbps
Enterprise applications	1 to 10 Mbps
Standard definition TV	2 Mbps
Distance learning	3 Mbps
Basic, high-speed Internet	5 Mbps
High-Definition TV	7.5 to 9 Mbps
Multimedia Web interaction	10 Mbps
Enhanced, high-speed Internet	10 to 50 Mbps

Source: *Mobile Broadband Spectrum Demand* at 15.

As Rysavy notes: “Some of the key applications that appear to be driving mass-market adoption of wireless broadband include mobile video, social networking, enterprise productivity, user-generated content, instant messaging, location-based services, and Web 2.0 applications. Users, particularly younger ones, are expecting the same Internet experience on their mobile devices as that available on desktop systems and vendors are responding.”²¹

Innovative Pricing. The *Mobile Broadband Spectrum Demand* paper also notes that wireless providers have offered a wide array of pricing plans designed to meet the individual needs of their consumers.²² In its deployment of voice services, wireless providers led the way in developing creative service and pricing plans. The creativity of pricing plans is noteworthy including: free long distance, free first minute, free in-network, free nights and weekends, pre-paid, family plans, bucket plans, and unlimited calling and data plans. This is the sign of a competitive and innovative industry – service providers responding to consumer needs and wants on a variety of fronts.

The wireless industry has brought similar creativity and innovation to the mobile broadband world. Wireless consumers have a number of options for service plans including bundled Internet access. Consumers requiring less data can choose to subscribe to metered broadband, paying for either a “bucket of bits,” similar to voice plan pricing or subscribing to

²¹ *Mobile Broadband Spectrum Demand* at 8.

²² *Mobile Broadband Spectrum Demand* at 10.

“all you can eat” broadband offerings either on a month-to-month basis or under longer term contracts providing discounted rates. These options enable consumers to tailor their wireless service plans to their broadband needs.

Fixed-Mobile Substitution and Fixed-Mobile Convergence. The *Mobile Broadband Spectrum Demand* paper describes two relevant trends in the mobile broadband world. First, “users are starting to use mobile broadband connections to the Internet as an alternative to wireline connections such as DSL.”²³ As FCC data demonstrate, mobile broadband additions are driving the growth of high-speed lines overall. The Commission’s data shows that, since 2005, mobile wireless providers have been the fastest-growing providers of both high-speed lines (over 200 kbps in at least one direction) and advanced service lines (over 200 kbps in both directions), with subscriber counts for high-speed lines more than doubling and advanced service lines more than tripling from just one year earlier.²⁴ The report further demonstrates that wireless broadband additions from June 2007 to June 2008 (the most recent data available) outpaced, by nearly three to one, the additions for cable companies and wireline telephone companies combined.²⁵

Similarly, fixed-mobile convergence is also facilitating greater use of mobile devices in stationary environments, for example, through the use of Wi-Fi connections or femto cells. As Rysavy notes, this trend is allowing users to choose devices that are designed for use in all environments and for all communications.²⁶

Application Innovation Effect -- The Virtuous Cycle. As Rysavy observes: “capability encourages innovation.”²⁷ It is important to recognize that this level of application and device innovation is made possible by the investment and innovation at the network core. Every stage of the wireless broadband ecosystem participates in this virtuous cycle, beginning with wireless providers and equipment vendors. Without significant investment in networks and innovative research and development of next generation wireless technologies, consumers would not now be reaping the benefits of innovation at the network edge.

Rysavy describes the virtuous cycle occurring in the wireless ecosystem in this way: “more capable networks enable more applications, attracting greater usage and subscription rates, encouraging more developers to create better applications and devices, further stimulating demand and market growth.”²⁸

As wireless networks have evolved to third generation wireless technologies and more spectrum has been made available and deployed by wireless providers to provide additional capacity, new and innovative devices have emerged to take advantage of those networks. From smartphones to PC cards, netbooks to commercial mobile radio service (“CMRS”)-enabled Wi-Fi hotspots, innovation in the wireless device sector is bringing American consumers and businesses new and innovative ways to use third and fourth generation mobile wireless broadband wherever and whenever they want it.

²³ *Mobile Broadband Spectrum Demand* at 10.

²⁴ *2008 FCC High-Speed Services Report* at Tbl. 1. [Double check calculation on June 2008 data]

²⁵ *Id.*

²⁶ *Mobile Broadband Spectrum Demand* at 11.

²⁷ *Mobile Broadband Spectrum Demand* at 9.

²⁸ *Mobile Broadband Spectrum Demand* at 9.

As both next generation networks and innovative new devices and applications reach the consumer, the innovation at the edge – applications and services – brings new options to consumers. Consumer demand for these applications and services, in turn, drive carriers to reinvest in wireless networks to fuel the next generation of wireless innovation. This virtuous cycle of innovation in both the network and the edge has brought faster speeds, more robust networks, innovative devices, and innovative applications to U.S. consumers.

The FCC’s exclusive-use, flexible licensing regime has enabled CMRS licensees to invest in network deployment and expansion, and to maximize their spectrum use. This approach breeds innovation and investment in the U.S. and has resulted in the world’s most competitive wireless marketplace. Of course, the lifeblood of the mobile wireless industry is spectrum, and in order for the virtuous cycle to continue to turn on the axes of innovation and investment, the Commission must identify additional spectrum to ensure that the U.S. mobile wireless market remains the world’s leader.

Comparing Surging Usage to Capacity Demonstrates The Need for Additional Spectrum

In addition to identifying the market forces behind soaring mobile broadband growth, the *Mobile Broadband Spectrum Demand* paper includes quantitative analyses that detail the significant additional demands that will be placed on wireless networks. Projecting future usage is an inexact science, yet the *Mobile Broadband Spectrum Demand* paper attempts to provide guidance on the scale of mobile data growth and the capacity of wireless networks relative to application demand.

Mobile broadband providers are already experiencing significant volumes of data traffic on their networks and projected volumes are expected to grow exponentially. The *Mobile Broadband Spectrum Demand* sets out several helpful data points in understanding the marked growth in mobile data traffic:

- **Voice traffic will triple between now and 2018 while data will grow 100 times faster, according to AT&T estimates.²⁹**
- **Wireless data traffic will double every two years through 2012, according to a 2008 Cisco projection.³⁰**

In more recent projections, Cisco has extended that growth rate out through 2013, projecting that:

- **Mobile traffic will increase 66 times between 2008 and 2013.³¹**
- **The mobile data traffic footprint of a single mobile subscriber in 2015 could very well be 450 times what it was in 2005.³²**

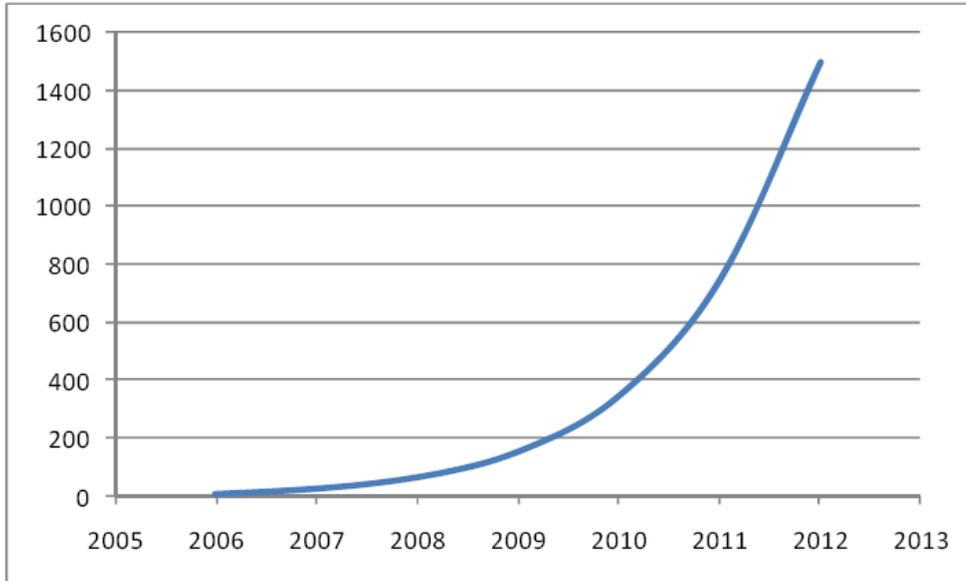
²⁹ *Mobile Broadband Spectrum Demand* at 11.

³⁰ *Mobile Broadband Spectrum Demand* at 11, citing “Approaching the Zettabyte Era,” Cisco (June 2008).

³¹ *3GPP Technology Approaches For Maximizing Fragmented Spectrum Allocations*, 3G Americas at 18 (July 2009) (“2009 3G Americas Spectrum Paper”).

This dramatic increase in mobile broadband traffic is depicted in the following figures:

Cisco Mobile Broadband Projection (Petabytes Per Month)



Source: *Mobile Broadband Spectrum Demand* at 13.³³

Growth in Data Traffic from Single Monthly Mobile Subscriber



Source: *2009 3G Americas Spectrum Paper* at 19.³⁴

³² *3GPP Technology Approaches For Maximizing Fragmented Spectrum Allocations*, 3G Americas at 18 (July 2009) (“2009 3G Americas Spectrum Paper”).

³³ *Mobile Broadband Spectrum Demand* at 13, citing “Approaching the Zettabyte Era,” Cisco (June 2008).

³⁴ *2009 3G Americas Spectrum Paper* at 19, citing “Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update,” Cisco (Jan. 2009).

After considering these projected growth rates, Rysavy engages in a quantitative capacity analysis to determine “how many people using which applications current network capacity can support...”³⁵ Noting the importance of mechanisms to manage bandwidth usage, Rysavy concludes:

[S]everal users within the same cell sector engaging simultaneously in high-throughput applications (*e.g.*, video streamlining) can quickly strain the network impacting the user experience for every consumer accessing the network, even if they are not themselves engaging in bandwidth-intensive activities.³⁶

To gain additional insight, the *Mobile Broadband Spectrum Demand* paper also engages in a “monthly usage analysis” and comparison of network capacity to average subscriber usage.³⁷ Considering all of these approaches, Rysavy concludes that “it is unlikely that operators will be able to deliver satisfactory service in the future at these high traffic volumes using existing spectrum.”³⁸ After analyzing the various alternatives, including increasing spectral efficiency and adding cell sites, the paper nonetheless finds that:

Mobile broadband networks can only meet these [projected] needs with the timely addition of new spectrum.³⁹

Despite carriers’ massive network investments – over 22 billion dollars per year over the past ten years – wireless carriers cannot simply “build their way out” of capacity problems because spectrum is a limited resource. Instead, U.S. policymakers must make it a priority to deliver additional spectrum to benefit wireless consumers.

³⁵ *Mobile Broadband Spectrum Demand* at 13.

³⁶ *Mobile Broadband Spectrum Demand* at 15.

³⁷ *Mobile Broadband Spectrum Demand* at 16-20.

³⁸ *Mobile Broadband Spectrum Demand* at 12.

³⁹ *Mobile Broadband Spectrum Demand* at 24.

Preventing the Coming Spectrum Drought

In this section, CTIA urges U.S. policymakers to launch a major effort to identify and allocate a significant amount of spectrum for commercial mobile broadband use. While it is impossible to identify what amount of additional spectrum would be “future proof,” CTIA suggests a dual approach to meet rapidly accelerating demand and maintain U.S. leadership in the global mobile broadband marketplace.

First, in recognition of the long lead times necessary to achieve major spectrum allocations, *the U.S. should immediately set itself on a course to identify a target of at least 800 MHz of additional spectrum for licensed commercial wireless use within the next six years.* Although it is difficult to predict exactly how much spectrum is needed, this filing also provides important benchmarks for U.S. policymakers to consider. As a starting point, CTIA presents a valuable international perspective on the spectrum planning of our global competitors, who are actively preparing for a mobile broadband future by allocating significantly more spectrum for commercial wireless services than the United States. In addition, this paper highlights the detailed analysis of the International Telecommunications Union in estimating spectrum bandwidth requirements for 2010, 2015, and 2020.

Finally, CTIA encourages policymakers to address short-term needs by pairing and allocating readily-available spectrum in the 1755-1780 MHz and 2155-2180 MHz bands to licensed commercial wireless use.

Identifying and Allocating Spectrum to Meet Growing Demands

The U.S. Must Make a National Commitment to Wireless Commensurate with our Global Competitors. As described below, U.S. policymakers need to target literally hundreds of MHz of additional spectrum for commercial wireless use in order to keep our nation on par with the future allocations of global wireless competitors and to maintain U.S. wireless leadership.

As CTIA has demonstrated in prior filings, U.S. commercial wireless carriers are the most efficient users of spectrum worldwide. With just under 410 MHz of spectrum – a number that includes AWS-1, 700 MHz and BRS allocations that may not yet be available for use – U.S. wireless carriers provide service to more than 270 million subscribers. With more than 651,000 subscribers served per MHz of spectrum allocated, U.S. carrier efficiency far surpasses that of other carriers in the OECD’s top ten countries by GDP.

In fact, U.S. carriers serve more than three times more consumers per MHz than carriers in the United Kingdom, double the consumers per MHz of Japanese carriers, more than double the European average and more than six times the number of consumers per MHz of our

Canadian neighbors. As demonstrated above, however, demand for mobile wireless broadband is projected to continue to increase at exponential rates.

While U.S. wireless carriers may lead the world in spectral efficiency, additional spectrum will be needed to accommodate rising demand. Yet, CTIA’s research on spectrum efficiency revealed another startling statistic. Despite overwhelming use and increasing demand, the U.S. is lagging behind other OECD nations in one particular wireless broadband category – additional spectrum identified for licensed commercial use. As demonstrated in the following chart, our global competitors have made major national commitment to their own mobile broadband futures, while the U.S. has dedicated hundreds of MHz less spectrum for commercial wireless uses.

Spectrum Pipeline – International Comparison



	 USA	 Japan	 Germany	 U.K.	 France	 Italy	 Canada	 Spain	 S. Korea	 Mexico
Subscribers**	270.3m	110.6m	107.0m	76.8m	57.5m	89.9m	21.7m	53.1m	46.2m	79.4m
Average Consumers' Minutes of Use per Month**	830	134	102	193	251	128	420	149	306	170
Average Revenue per Minute – A Measure of the Effective Price per Voice Minute**	\$0.05	\$0.25	\$0.15	\$0.10	\$0.14	\$0.15	\$0.08	\$0.19	\$0.07	\$0.06
Efficient Use of Spectrum -- Subscribers Served per MHz of Spectrum Allocated	660,073	314,985	350,819	217,687	153,497	288,696	105,853	148,324	198,283	661,666
Spectrum Assigned for Commercial Wireless Use	409.5 MHz*	347 MHz	305 MHz	352.8 MHz	374.6 MHz	311.4 MHz	205 MHz	358 MHz	233 MHz	120 MHz
Potentially Usable Spectrum/In the Pipeline***	50 MHz	165 MHz	340 MHz	355 MHz	72 MHz	254 MHz				120 MHz

*Figure includes AWS-1, 700 MHz spectrum not yet in use and 55.5 MHz of spectrum at 2.5 GHz.
 ** Glen Campbell, et al., "Global Wireless Matrix 1Q09," Merrill Lynch, June 25, 2009, at Table 1.

***Complete information on "pipeline" spectrum was not available for all countries at the time of filing/publication.

Source: CTIA estimates.

As shown above, the United Kingdom has more than 350 MHz currently licensed to CMRS providers, serving Britain’s 76 million subscribers. In addition to the currently licensed spectrum, Ofcom, the UK regulator has identified and is in the process of reallocating an additional 355 MHz of spectrum for CMRS.

- **The result will be nearly 710 MHz, more than double the spectrum currently available to Britain’s wireless broadband providers and over 300 MHz more than what is available to U.S. wireless providers.**

Similarly, in Germany there are 340 MHz of spectrum identified to be reallocated for CMRS, bringing the spectrum available to German wireless broadband providers to 645 MHz, over 200 MHz more than what is available in the U.S. In sharp contrast, the United States, the world leader in mobile Internet use has a mere 50 MHz of spectrum “in the pipeline” for CMRS providers – the AWS-2 and AWS-3 allocations which have been long pending and plagued by technical challenges.

CTIA believes that, just as policymakers in the UK have recognized the importance of bringing to market significant additional spectrum resources for mobile broadband, addressing our global spectrum imbalance must be a key priority for U.S. policymakers. The Commission’s National Broadband Plan must include additional identified allocations of spectrum for CMRS, along with an identified path for reallocation and clearing of incumbent users. To put the U.S. on par with its global counterparts in the U.K., CTIA believes that the Commission must identify hundreds of MHz of additional spectrum for licensed commercial use.

ITU Projections Show Massive Needs for Additional Commercial Wireless Spectrum Allocations. CTIA also provides another useful benchmark for the Commission’s analysis: the International Telecommunications Union’s technical projections for additional spectrum bandwidth for mobile and advanced mobile applications.

In 2006, the ITU attempted to estimate the additional spectrum that would be needed for a single wireless network for each country in the years 2010, 2015, and 2020.⁴⁰ The ITU’s estimates include variations for different countries that have developed mobile capabilities earlier (“higher market setting”) or later (“lower market setting”) and include analyses of different technologies deployed (Radio access technique groups or “RATG”). In this paper, the ITU examines RATG 1 and RATG 2, which include both cellular mobile systems as well as advanced mobile broadband technologies such as 3G and 4G.⁴¹

⁴⁰ *Estimated Bandwidth Requirements for the Future Development of IMT-2000 and IMT-Advanced*, International Telecommunications Union, Report ITU-R, M.2079 (2006) (“*ITU Spectrum Requirements*”).

⁴¹ *ITU Spectrum Requirements* at 1-5. See also “IMT Advanced,” Telecom ABC , viewed at: <http://www.telecomabc.com/i/imt-advanced.html>.

The following table depicts the ITU’s recommendations for spectrum bandwidth on a per country basis:

Market setting	Spectrum requirement for RATG 1			Spectrum requirement for RATG 2			Total spectrum requirement			
	Year	2010	2015	2020	2010	2015	2020	2010	2015	2020
Higher market setting		840	880	880	0	420	840	840	1 300	1 720
Lower market setting		760	800	800	0	500	480	760	1 300	1 280

ITU’s Estimated Spectrum Requirements Per Country

Source: *ITU Spectrum Requirements* at 25.

When the Next Generation Mobile Networks Alliance – a coalition of wireless providers, industry partners, and academic advisors – reviewed the ITU projections, it determined that an additional 500 MHz to 1 GHz of spectrum would be required, depending on region.⁴² ***Whatever the precise requirement, it is immediately clear that the 410 MHz of spectrum dedicated for commercial wireless service in the U.S. falls far below the ITU’s estimated spectrum requirements.*** With the most wireless subscribers, the highest minutes of use, and most early adoption of mobile broadband services, the U.S. would certainly rank among the most in need of additional spectrum resources.

As mentioned above, these projections are based on the use of only one wireless network per country. To better reflect real world circumstances, the ITU also adjusts its estimates for countries with more than one wireless network, providing additional estimates for countries with two, three, four, or five networks. Not surprisingly, the bandwidth requirements increase for countries with multiple networks. CTIA has provided clear evidence from independent sources that the U.S. has the most wireless networks and least concentration among the group of leading 26 OECD countries with whom we compete.⁴³ Thus, we would expect the U.S. to be at the high end of the spectrum needs projected by the ITU.

To set a realistic benchmark for U.S. efforts, CTIA conservatively points to the ITU’s requirements for 2015. Even assuming only one wireless network and a low market setting, U.S. spectrum requirements would be 1,300 MHz. Further assuming that policymakers allocate the additional targeted 50 MHz immediately as described below, ***the U.S. would still need to identify and allocate just over 800 additional MHz of spectrum for commercial wireless services within the next six years.*** This is a significant national undertaking, but one that must commence immediately in order to keep U.S. consumers and businesses armed with the tools that will be needed to develop a fully robust mobile broadband marketplace.

⁴² *Spectrum Requirements for the Next Generation of Mobile Networks*, NGMN Alliance at 22 (June 2007).

⁴³ See, e.g., Comments of CTIA – The Wireless Association, WT Docket No. 09-66, at 5 (filed June 15, 2009) (“*CTIA CMRS Competition Report Comments*”).

While CTIA urges U.S. policymakers to launch immediately a process to bring at least 800 MHz of additional spectrum to market for licensed commercial wireless services, the Commission can and must also take interim steps to meet the burgeoning need for additional commercial wireless spectrum. In particular, the Commission should address short-term needs by pairing and allocating readily-available spectrum in the 1755-1780 MHz and 2155-2180 MHz bands to licensed commercial wireless use.

As policymakers search for readily-available spectrum, they should consider bands that have been identified internationally by the ITU for International Mobile Telecommunications-2000 (“IMT-2000”) or IMT-Advanced services as likely candidates for reallocation. In this section, CTIA explains that the 1755 to 1780 MHz band is an ideal choice for reallocation: (1) from an international harmonization standpoint, (2) because of recent relocation experience of Federal incumbents in adjacent spectrum bands and (3) due to its compatibility with other spectrum allocations in the United States for CMRS systems. While significant care is required to ensure that displaced Federal users in the band are compensated and relocated to comparable facilities, CTIA believes that such a relocation is feasible, practical and in the public interest.

The 1755 to 1780 MHz Band is the Final Spectrum Band Identified Internationally for Next Generation Wireless Systems that is Not Available for CMRS. International standards bodies have been working for years identifying capabilities and spectrum bands necessary for next generation wireless systems. Initially, ITU concluded that IMT-2000 (or 3G) systems would require use of additional spectrum beyond what was already encumbered by first and second-generation mobile systems (1G and 2G, respectively).⁴⁴ Moreover, due to the physical characteristics governing the propagation of radio waves in the frequency range below 3 GHz, these frequencies are better able to be efficiently transmitted and received by small mobile wireless devices.⁴⁵ Therefore, spectrum identified for IMT-2000 (and IMT-Advanced) is ideally located below 3 GHz.

Having determined that spectrum for next generation wireless systems should be located below 3 GHz, the next critical step is to identify a particular candidate band for reallocation. Once again, the IMT-2000 and IMT-Advanced efforts undertaken by ITU would help guide this decision. At the 1992 World Administrative Radio Conference (“WARC-92”), 230 MHz of spectrum at 1885 to 2025 MHz and 2110 to 2200 MHz was identified for use by countries wishing to implement 3G systems. Additionally, at the 2000 World Radio Conference (“WRC-2000”), three additional bands were identified for use: (1) the 698 to 960 MHz band; (2) the 1710 to 1885 MHz band; and (3) the 2500 to 2690 MHz band.⁴⁶

Among the spectrum identified for IMT-2000 or IMT-Advanced uses, the most readily available spectrum band for use by next generation wireless systems is the 1755-1850 MHz band, as the vast majority of other spectrum bands have already been allocated and/or licensed

⁴⁴ See e.g., *Federal Operations in the 1755-1850 MHz Band: The Potential for Accommodating Third Generation Mobile Systems*, Interim Report, U.S. Department of Commerce (rel. Nov. 15, 2000) (“NTIA Interim Report”) at 6. This report can be found at: <http://www.ntia.doc.gov/osmhome/reports/imt2000/imt2000.pdf>

⁴⁵ *Id.* at 7.

⁴⁶ See *Provisional Final Acts of WRC 2000*, 8 May-June 2000, Istanbul, Turkey, International Telecommunications Union.

for use.⁴⁷ By reallocating this spectrum band, the FCC will allow CMRS next generation wireless networks to be built in a manner that is consistent with the goals described by the ITU. This reallocation would also enable U.S. wireless operators to upgrade their existing networks to deliver broadband services to the American public in a spectrum band that fully complies with the worldwide expectations for IMT-2000 and IMT-Advanced services.

U.S. Wireless Operators Have Extensive Experience Relocating Federal Incumbents in the 1.7 GHz Band. The 1755-1780 MHz band is also a promising relocation target because CMRS providers have a great deal of recent experience in relocating many of the Federal incumbents in the band. The adjacent 1710-1755 MHz band has been the subject of relocation for nearly three years, with 12 different Federal agencies being relocated by AWS licensees.⁴⁸ Similar to the 1710-1755 MHz band, the predominant Federal use of the 1755-1780 MHz band is for fixed microwave services.⁴⁹ CMRS providers, especially those who relocated fixed microwave incumbents in the PCS (1850-1990 MHz) and AWS bands (2110-2155 MHz/1710-1755 MHz) have extensive experience in relocating fixed microwave systems. Moreover, the relationships between the affected Federal agencies and many of the CMRS providers are very strong and current given the ongoing relocation operations in the AWS-I band. As such, the 1755-1780 MHz band presents an excellent opportunity for the Federal Government and CMRS providers to build upon existing expertise in relocation.

The 1755 to 1780 MHz Band Is Ideal For Pairing With Existing Spectrum in the 2.1 GHz Band. As noted above, spectrum in the 2155-2180 MHz band has been reallocated for CMRS uses. While the Commission has tentatively concluded to pair the 2175-2180 MHz band with the 2020-2025 MHz band, the spectrum from 2155-2175 MHz is unpaired at this point. While some parties have argued that the spectrum could be put to use by Time Division Duplex technology (whereby both base and mobile operations could operate in this single spectrum band),⁵⁰ such an outcome would be inconsistent with the international use of the band for base station operations.⁵¹

⁴⁷ A number of reallocations and auctions have occurred since the WRC outcomes. For example, the 1850-1990 MHz band was reallocated from fixed microwave system use to the Personal Communications Service (“PCS”) in 1992, with auctions held for the spectrum from 1994 to 1996. The 2110-2200 MHz band was reallocated from fixed microwave uses to fixed and mobile allocations, including Mobile Satellite Service (“MSS”) in the 2180-2200 MHz band and Advanced Wireless Service (“AWS”) in the 2110-2180 MHz band. MSS licenses were granted in the 2180-2200 MHz band, and the 2110-2155 MHz band was paired with reallocated Federal spectrum in the 1710-1755 MHz band and auctioned to AWS licensees in 2006. The 2175-2180 MHz spectrum was paired with the 2020-2025 MHz band and still awaits a final ruling from the Commission, as does the unpaired AWS spectrum in the 2155-2175 MHz band. The 2500-2690 MHz band is in the midst of a transition from wireless cable and fixed two way internet services to a CMRS offering by Clearwire (with grandfathered protection to educational broadcasting service incumbents). The 698-806 MHz band has been reallocated and auctioned to 700 MHz licensees by the Commission, along with a 24 megahertz set aside for public safety communications networks. The 806-896 MHz band contains public safety mobile systems, air-ground mobile systems that recently received licenses via auction and incumbent 800 MHz cellular networks.

⁴⁸ See e.g., http://www.ntia.doc.gov/osmhome/reports/specrelo/pdf_20090601/data_2009_06.htm for a list of affected Federal agencies (last visited Aug. 19, 2009).

⁴⁹ See e.g., NTIA Interim Report at 15 (summary table noting that of the 4869 assignments for Federal stations in the 1755-1850 MHz band as of September 2000, 3836 were for the fixed service).

⁵⁰ See e.g., Ex Parte Presentation of M2Z Networks, Inc., WT Dkt. No. 07-195, filed Aug. 6, 2009.

⁵¹ See e.g., Ex Parte Presentation of 3G Americas LLC, WT Dkt. No. 07-195, filed Oct. 23, 2008 (“...the proposed allocation would undermine the long-standing goal of global harmonization of spectrum for advanced wireless services, including broadband access to the Internet.”)

Rather, the 1755-1780 MHz band should be reallocated for licensed CMRS use, paired with the 2155-2180 MHz spectrum. Such a pairing of spectrum bands would allow for a rapid auction of 50 megahertz of paired spectrum, the vast majority of which has been identified internationally for IMT uses. Furthermore, this spectrum is ideally suited to the types of services and uses contemplated by CMRS providers for next generation services. Finally, use of the 2155-2180 MHz band for base station operations and the 1755-1780 MHz band for mobile station operations would be consistent with the international use of the spectrum bands – leading to greater economies of scale and scope and driving down costs for equipment.⁵² Potential CMRS providers in this paired spectrum would be able to implement and deploy this spectrum in an expeditious fashion, capitalizing on the efforts and development done by manufacturers and providers in other markets for similar products in this spectrum band and more quickly bringing needed spectrum online to meet consumer demands for wireless broadband services.

⁵² *Id.* (“Now more than ever, the economies of scale from a common band plan for the Americas and the world’s other regions is critical to ensuring the industry can deliver a valuable service to the U.S. wireless consumer.”)

CONCLUSION

As described above, a confluence of market trends is combining to form a virtuous cycle of innovation, investment and adoption that will require significant additional spectrum resources. CTIA has provided international benchmarks showing that the U.S. needs to identify and allocate a target of 800 MHz of additional spectrum for licensed commercial wireless services within the next six years if U.S. consumers are to reap the benefits of a truly mobile broadband marketplace.

To meet this need, CTIA supports plans to create a comprehensive inventory of spectrum as an important means to identify new allocations for licensed mobile wireless services. CTIA applauds the efforts of Senators Kerry and Snowe and Congressmen Waxman and Boucher to require such an inventory.⁵³ These Senators and Congressmen have introduced legislation that would require the Commission and NTIA to identify and report on spectrum use by government spectrum assignees, non-government licensees, and unlicensed devices. This is a good first step, but it must be coupled with concrete action.

Beyond the first step of inventorying, U.S. policymakers must be ready to commit to identifying and allocating significant additional spectrum resources. That will mean looking at all users and uses, including government spectrum usage. It is likely that underutilized spectrum currently assigned to the Federal government will be a critical source for spectrum that can be repurposed. The spectrum inventory may also identify underutilized non-government spectrum - - whether currently allocated or licensed to broadcasters, satellite providers, or others -- that can be put to a higher and better use as commercial mobile wireless spectrum. While such reallocations may require difficult choices by policymakers, this filing makes clear that, without swift and bold action, U.S. consumers and businesses are risk of missing out on the tools they need to compete in a global marketplace and the U.S. will find itself less able to harness the many externalities of high-bandwidth mobile services.

Pursuant to Section 1.1206 of the Commission's rules, a copy of this letter is being filed via ECFS with your office. Should you have any questions, please do not hesitate to contact the undersigned.

Sincerely,

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⁵³ Radio Spectrum Inventory Act, S. 649, 111th Cong. 1st Sess (2009).