

**Before the
Federal Communications Commission
Washington, DC 20554**

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

COMMENTS – NBP PUBLIC NOTICE # 6

**COMMENTS OF VERIZON WIRELESS ON
SPECTRUM FOR BROADBAND**

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October 23, 2009

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I. SUMMARY

Verizon Wireless respectfully submits these comments in response to the FCC’s Public Notice on Spectrum for Broadband.¹ The market for mobile broadband services is growing at a significant rate, and this growth is expected to increase exponentially in the future. As a result of this tremendous growth, and despite the substantial efforts that Verizon Wireless and other wireless carriers continually make to increase the efficiency of their wireless networks and their underlying spectrum, significant allocations of additional spectrum will be needed in the future. In fact, experts predict that demands for commercial spectrum will quadruple over the next ten years. We urge the Commission to act promptly to identify additional spectrum for future use, and to make every effort to identify spectrum that will best accommodate mobile broadband services and maximize the efficiency and cost effectiveness of mobile broadband networks. This requires that additional spectrum be identified, to the greatest extent possible, with the following

¹ *Public Notice, DA 09-2100; Comment Sought on Spectrum for Broadband, NBP Public Notice #6, GN Docket Nos. 09-47, 09-51, 09-137, rel. Sep. 23, 2009 (“Spectrum Public Notice”).*

properties: (1) in the range of 400 MHz to 5 GHz; (2) able to accommodate large blocks of contiguous spectrum; (3) in close proximity to bands already used (or planned to be used) for CMRS; (4) globally harmonized; and (5) subject to exclusive licensing and flexible use.

We appreciate the Commission's efforts to seek focused comment on the sufficiency of current spectrum allocations that will support mobile broadband, as well as the sense of urgency expressed by Chairman Genachowski² and the FCC's Broadband Task Force³ in addressing the looming spectrum shortage. However, it is also critical that spectrum which is allocated and licensed for mobile broadband purposes be cleared of incumbent services and, thus, actually made available for full use. In the Chairman's recent remarks to the wireless industry, he outlined a four-part plan to ensure that the U.S. wireless industry remains a world leader.⁴ The first two parts of that plan are: (1) "unleashing spectrum for 4G mobile broadband and beyond;" and (2) "removing obstacles to robust and ubiquitous 4G deployment." We concur wholeheartedly. Unfortunately, those two objectives have not been met for spectrum already allocated and licensed, and for which companies paid in excess of \$19 billion. The 700 MHz band, former TV spectrum on which Congress and the Commission spent considerable time and resources to reallocate for advanced wireless services, still remains heavily encumbered because the Commission has not yet taken action to clear the band of wireless microphones. It is critical that the Commission take action now and ensure the band is cleared quickly.

² *Prepared Remarks of Chairman Julius Genachowski, Federal Communications Commission, "America's Mobile Broadband Future,"* International CTIA WIRELESS I.T. & Entertainment Conference, San Diego, California, October 7, 2009 ("Genachowski Remarks"); available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-293891A1.pdf.

³ Status Report of the FCC's Broadband Task Force on the Progress of the National Broadband Plan, presented to the Commission on September 29, 2009 ("Task Force Report"); available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-293742A1.pdf.

⁴ *Genachowski Remarks at 4.*

II. ADDITIONAL SPECTRUM ALLOCATIONS ARE NEEDED TO MEET THE RAPIDLY INCREASING DEMAND FOR MOBILE BROADBAND.

The substantial record already developed in this proceeding demonstrates clearly that the market for mobile broadband products and services has grown at a substantial rate, and that it will likely grow at an even more rapid pace in the future. Moreover, while sufficient spectrum may be available to support broadband wireless services in the near term, significant amounts of additional spectrum will be needed to support future demand. This was the clear message delivered by the FCC's Broadband Task Force in its September 29, 2009 report on the status of the Commission's processes for development of a National Broadband Plan.⁵ Based on numerous submissions in response to the FCC's broadband proceedings, expert testimony provided at various FCC workshops, and its own research and analysis, the Task Force has concluded that the enormous growth in bandwidth-hungry devices and applications is driving an increased demand for spectrum – demand that experts believe will exceed 1 GHz of total allocated spectrum by 2015. Moreover, the Task Force concludes that “the spectrum pipeline is drying up,” that it will take years for any new spectrum to reach the market, and as a result, the Commission must act now to provide the spectrum resources that will ensure future demand is met. We concur with the Task Force's conclusions.

One only has to look at the plethora of new mobile devices and applications available in the marketplace to know that mobile broadband has dramatically increased in use and importance in the past few years. However, that is only the tip of the iceberg of what we can expect in the future, based on studies conducted by various experts. Cisco Systems, Inc., for example, has estimated that, globally, mobile data and Internet traffic will double every year

⁵ *Task Force Report.*

through 2013, increasing 66x between 2008 and 2013.⁶ This includes handset-based data traffic, such as text messaging, multimedia messaging, and handset video services, as well as mobile Internet traffic generated by wireless cards for portable computers and handset-based mobile Internet usage. Chetan Sharma Consulting estimates that mobile data traffic in the United States will increase at an even more rapid rate. It estimates that mobile data traffic will increase by a factor of 145x between 2008 and 2013, and by a factor of 300x by 2014.⁷

Rysavy Research concludes that this explosion in the growth of mobile broadband is not surprising, as it is occurring “at a unique and pivotal time in history, in which technology capability, consumer awareness and comfort with emerging wireless technology, and industry innovation are converging to create mass-market acceptance of mobile broadband.”⁸ It concludes that there are a variety of factors contributing to this enormous growth, including increased innovation in mobile broadband applications and increased availability of smartphones and other data devices that support such applications. In addition, the deployment of advanced 3G networks that support higher data rates, such as Verizon Wireless’ EV-DO network, has substantially improved the mobile broadband experience for wireless consumers. This increase

⁶ Cisco provides estimates for mobile data and Internet traffic worldwide as well as estimates for different regions of the world, e.g., North America, but it does not provide specific estimates for the United States. “*Cisco Visual Networking Index: Forecast and Methodology, 2008-2013*,” Cisco Systems, Inc., June 9, 2009, available at http://www.cisco.com/en/US/netsol/ns827/networking_solutions_sub_solution.html.

⁷ “*Managing Growth and Profits in the Yottabyte Era*,” Chetan Sharma Consulting, July 2009, available at <http://www.chetansharma.com/yottabyteera.htm>.

⁸ “*Mobile Broadband Spectrum Demand*,” Rysavy Research, December 2008, at 5, available at http://www.rysavvy.com/Articles/2008_12_Rysavy_Spectrum_Demand_.pdf (“Rysavy Report”). See also “*HSPA to LTE-Advanced: 3GPP Broadband Evolution to IMT-Advanced (4G)*,” Rysavy Research and 3G Americas, September 2009, available at http://www.rysavvy.com/Articles/2009_09_3G_Americas_RysavyResearch_HSPA-LTE_Advanced.pdf.

in user satisfaction translates into greater use of mobile broadband applications and, as a result, greater spectrum usage. Rysavy concludes that licensing significant amounts of additional spectrum over the next decade is imperative if the United States wants to support the continued growth of mobile broadband and ensure that wireless networks continue to provide increasing capabilities to American consumers.

III. RESPONSES TO SPECIFIC QUESTIONS FROM PUBLIC NOTICE

As requested in the Public Notice, Verizon Wireless provides the following responses to the Commission's questions concerning the allocation of spectrum to support broadband:

1. Adequacy Of Current Spectrum Allocations To Support Broadband

The Spectrum Public Notice asks about the ability of current spectrum allocations to support next-generation networks, how these networks can be designed to promote greater spectrum efficiency, and whether additional spectrum allocations for licensed or unlicensed operations will ultimately be needed in the future. Verizon Wireless believes that sufficient spectrum is currently available to support the initial construction of next-generation networks. Five years into the future, however, additional spectrum will be needed to meet the demand for mobile broadband services.

The rapid exhaustion of available spectrum resources that is expected over the next few years is consistent with the exponential growth in mobile broadband that is predicted by Cisco, Chetan Sharma, Rysavy, and others. Current spectrum allocations will be exhausted despite continued efforts by wireless carriers to make more efficient and intensive use of their licensed spectrum. These efforts to promote greater spectral efficiency were addressed by Verizon Wireless in its Comments in response to the Commission's Wireless Innovation Notice of

Inquiry (“NOI”),⁹ and described in greater detail by Bill Stone, Verizon’s Executive Director of Network Technology, at the FCC’s Broadband Spectrum Workshop on September 17, 2009.¹⁰

As Mr. Stone described, there are three fundamental ways in which wireless operators can respond to the increasing demand for wireless services and access to spectrum. The first is to deploy more advanced and more spectrally efficient radio technologies. Over the past two decades, the wireless industry has constantly updated the technologies used to provide wireless services, driving innovation and efficiency at incredible rates. Verizon Wireless has been a leader in driving these innovations in wireless efficiency, making huge investments in successive wireless technologies – CDMA 1xRTT, CDMA EV-DO, and now LTE – each of which have brought major improvements in network speeds and efficiency. Importantly, Mr. Stone and other participants in the FCC’s Broadband Workshop noted that we have likely reached the pinnacle in spectral efficiency, as measured on a bits per Hertz basis.¹¹ While continued innovations in wireless technology (e.g., LTE-Advanced) will provide increasing capabilities for wireless consumers (e.g., higher data rates), we cannot expect to see significant increases in spectral efficiency over what is already available with current technology.

The second way to maximize the use of existing spectrum is to optimize the design of the network such that spectrum is reused to the greatest extent possible. As described in comments

⁹ See generally Comments of Verizon Wireless, *Fostering Innovation and Investment in the Wireless Communications Market* (“Verizon Wireless Innovation Comments”), Notice of Inquiry, FCC 09-66 (2009).

¹⁰ Testimony of Bill Stone, Executive Director – Network Strategy for Verizon Wireless, FCC’s Broadband Workshop on Spectrum, September 17, 2009 (“Stone Testimony”), available at http://www.broadband.gov/ws_spectrum.html.

¹¹ See generally Stone Testimony; see also Testimony of Rajiv Laroia, Ph.D., Senior Vice President of Technology for Qualcomm, FCC’s Broadband Workshop on Spectrum, September 17, 2009, available at http://www.broadband.gov/ws_spectrum.html.

to the Wireless Innovation NOI, wireless carriers employ a variety of frequency reuse techniques including antenna sectorization, cell splitting, and the use of picocells and femtocells to make more efficient use of their spectrum.¹² Verizon Wireless and other CMRS licensees face “relentless” pressure to deploy these spectrum-efficient techniques, as they ensure that “additional users and revenues” can be accommodated.¹³ Of course, there is a limit to how extensively these techniques can be used. Continued efforts to expand the number of cell sites by decreasing the size of each cell does not come without its challenges. There are substantial upfront costs associated with building additional sites and constructing backhaul facilities to each of those sites, as well as substantial recurring costs associated with operating and maintaining those facilities. In addition, acquiring additional sites can be a very lengthy process that may be subject to local zoning and other regulatory hurdles, and managing interference between neighboring cell sites can create technical challenges. Wireless carriers will continue to employ these techniques, to the greatest extent possible, both for existing 3G networks as well as for next-generation networks. However, the Commission should not assume that these techniques alone will enable carriers to satisfy the rapidly increasing demand for spectrum.

The third way to address the increasing demand for mobile broadband is, of course, to acquire additional spectrum. While Verizon Wireless and other commercial licensees will continue to optimize their respective networks and invest in newer and better technologies to increase the capabilities made available to their customers, they will ultimately need additional

¹² *Verizon Wireless Innovation Comments* at 94-96.

¹³ Comments of Thomas Hazlett and Matthew Spitzer, ET Docket No. 03-237, at 33, 35 (April 5, 2004) (“Hazlett and Spitzer Interference Temperature Comments”).

spectrum.¹⁴ This fact is unavoidable given the convergence of wireless mobility and broadband Internet access. As already noted, numerous studies have analyzed the growing market for mobile broadband and concluded that significant additional spectrum must be allocated in order to keep up with demand and changing technologies.¹⁵ These studies make clear the urgency with which the Commission must act to identify and allocate additional spectrum for wireless services in order to maintain and promote innovation.

In 2006, the International Telecommunications Union (“ITU”) investigated the amount of spectrum that would be needed to meet its broadband objectives.¹⁶ The ITU “undertook to determine how much spectrum would be needed for the case of a single network per country” in

¹⁴ In its September 29, 2009 status report, the FCC’s Broadband Task Force reported that Verizon Wireless “might acquire more than 100 MHz of spectrum in the next five years, if it were available.” This conclusion was presumably based on a misunderstanding of Mr. Stone’s statement at the September 17th Broadband Workshop. Mr. Stone indicated that Verizon Wireless currently had sufficient spectrum to support both its current 3G and planned 4G networks for the next 3-5 years. Beyond five years, however, it expects to need additional spectrum. To meet future demands beyond five years, Mr. Stone said that the company might need an additional 100 MHz of spectrum. *See Stone Testimony*. Other industry participants in the FCC’s Broadband Workshop also indicated that substantial amounts of additional spectrum would be needed. A representative of Clearwire indicated that 120 MHz of spectrum would like be the minimum needed for a single competitor to deliver true broadband services. Testimony of John Saw, Senior Vice President and CTO for Clearwire, FCC’s Broadband Workshop on Spectrum, September 17, 2009, available at http://www.broadband.gov/ws_spectrum.html.

¹⁵ *Rysavy Report* at 3; “The capacity of a wireless network (and therefore the network’s ability to support wireless broadband services and applications) in any given location depends on spectral efficiency, as well as the amount of spectrum the operator has available. Mobile network operators are currently implementing or considering various mechanisms to maximize capacity by managing bandwidth consumption in the absence of access to more licensed spectrum. While engineering greater spectral efficiency and building more cell sites will increase capacity, alone they are unlikely to address the expected magnitude of the demand. Long term, more spectrum is needed to enable the U.S. mobile network operators to keep pace with consumer demand for more and faster mobile broadband.”

¹⁶ Estimated Spectrum Bandwidth Requirements for the Future Development of IMT-2000 and IMT-Advanced, Report ITU-R M.2078 (2006) (“ITU Bandwidth Requirements Report”).

the years 2010, 2015, and 2020,¹⁷ finding that where there was a higher level of market development, the total spectrum requirements would be 840 MHz in 2010, 1,300 MHz in 2015, and 1,720 MHz in 2020.¹⁸ The spectrum requirements identified by the ITU clearly outpace the Commission's current allocation of spectrum for commercial wireless use. Therefore, for the U.S. to remain a leader in wireless innovation, it must promptly begin to evaluate future spectrum needs and allocate new bands accordingly.

Importantly, new spectrum allocations made available for future mobile broadband services should be licensed for commercial use. Verizon Wireless recognizes the potential value of spectrum for unlicensed use. This includes broadband uses such as WiFi that may be complementary to licensed CMRS systems, e.g., by enabling traffic in high-density areas to be off-loaded onto localized Wi-Fi networks. However, unlicensed operation is not well suited for wide area mobile broadband systems that demand a high level of reliability. Consequently, the Commission should not rely on the shared use of unlicensed spectrum to support the demands of next-generation broadband networks.

In contrast to the current state of licensed spectrum allocations, the Commission has adopted allocations for significant amounts of unlicensed spectrum over the past five years. In 2003, the FCC provided for the use of an additional 255 MHz of spectrum in the 5 GHz band for unlicensed services, including fixed wireless and Wi-Fi systems.¹⁹ This amendment to Part 15 of

¹⁷ 3G Americas, 3GPP Technology Approaches for Maximizing Fragmented Spectrum Allocations, July 2009, ("3G Americas Report"), at 20; *available at* http://www.3gamericas.org/documents/3GA%20Underutilized%20Spectrum_Final_7_23_092.pdf.

¹⁸ *ITU Bandwidth Requirements Report* at 25.

¹⁹ *Revision of Parts 2 and 15 of the Commission's Rules to Permit Unlicensed National Information Infrastructure (U-NII) Devices in the 5 GHz Band*, Report and Order, 18 FCC Rcd 24484 (2003).

the Commission's rules was in addition to 300 MHz of spectrum that was already available for unlicensed systems in the 5 GHz band.²⁰ In total, unlicensed providers now have access to 555 megahertz of spectrum in the 5 GHz band. Taking into account these additional allocations, there is currently on the order of 674-956 MHz of spectrum available for unlicensed use – significantly more than what is available for exclusively licensed, flexible use CMRS. This information is summarized in Table 1.

Table 1. Spectrum Available for Unlicensed Use

Service	Spectrum Band	Total Spectrum
TV Band Devices	54-60 MHz 76-88 MHz 174-216 MHz 470-608 MHz 614-698 MHz	0 to 282 MHz ²¹
900 MHz Spread Spectrum	902-928 MHz	26 MHz ²²
Unlicensed PCS	1920-1930 MHz	10 MHz ²³
2.4 GHz Spread Spectrum	2400-2483.5 MHz	83.5 MHz ²⁴
Unlicensed National Information Infrastructure	5150-5350 MHz 5470-5725 MHz 5725-5825 MHz	555 MHz ²⁵
	Total Spectrum For Unlicensed Services	674.5 to 956.5 MHz

²⁰ 47 C.F.R. § 15.401.

²¹ See 47 C.F.R. §15.707.

²² See 47 C.F.R. §15.247.

²³ See 47 C.F.R. §15.301.

²⁴ See 47 C.F.R. §15.247.

²⁵ See 47 C.F.R. §15.401.

Verizon Wireless is not aware of any factual basis for the Commission to consider additional spectrum allocations for unlicensed use beyond the substantial amounts already reserved. Given the benefits of exclusive use licensing, as discussed *infra*, and the limited amount of spectrum available for that purpose, the Commission should focus its resources on the identification of more spectrum for licensed, exclusive use. The impacts of not taking such actions – on the wireless industry and the entire nation – are significant. A future spectrum shortage would stall the continued development of mobile broadband services, and place at risk the substantial benefits associated with such services to the U.S. economy and American consumers.

Effectively managing spectrum resources is a balancing act for wireless carriers. It involves a series of tradeoffs designed to maximize spectrum efficiency, minimize cost, and maximize network reliability and quality of service to the customer. A shortage of available spectrum would substantially limit a carrier's options in addressing these needs and, as a result, could impact the mobile broadband marketplace in a variety of ways. First, it could force wireless carriers to make network design decisions that are more costly, resulting in higher priced services, or create a greater risk of harmful interference, resulting in poorer quality services. As already noted, one way to expand available spectrum capacity is to more aggressively reuse spectrum by employing a larger number of cell sites. However, the costs associated with deploying and maintaining these sites and connecting them to the network via high-capacity backhaul systems are significant. In addition, a higher density cellular architecture increases the risk of harmful interference between neighboring cells. Managing this potential interference is critical, as increased interference could result in a reduction in throughput to the customer or a decrease in reliability.

More likely, a shortage of available spectrum would impede the continued development of innovative mobile broadband services, devices, and applications. Without additional spectrum, it would be difficult to support more spectrum-intensive broadband applications, and difficult (if not impossible) for carriers to deploy new, more advanced wireless technologies to support these applications. In fact, it is reasonable to assume that the lack of sufficient spectrum to accommodate new technologies would have a chilling effect on their development in the future, as there would be no incentive to develop new technologies if there is no viable way to implement them.

A spectrum shortage might also create incentives for wireless carriers to employ service and pricing policies designed to more closely manage use of mobile broadband networks, e.g., by establishing data caps, imposing higher usage based pricing, or limiting certain spectrum-intensive applications (e.g., full motion video). While it is important that wireless carriers have the ability to operate their networks in a way that enables them to maximize the benefits provided to all of their customers, artificial limitations that result from a spectrum shortage would make network management more difficult and constrain the types and quality of services available to consumers.

2. Spectrum Bands Best Suited For Mobile Services

The Spectrum Public Notice asks about the current stock of spectrum available to support mobile broadband services, what other spectrum bands might be repurposed to support future services, and what factors the Commission should consider in making its allocation decisions. As the FCC's Broadband Task Force reported in its recent update to the Commission, approximately 413 MHz of spectrum is currently used (or soon will be used) for CMRS. This includes 50 MHz in the 850 MHz cellular band, 130 MHz in the 1.9 GHz PCS band (including

recently licensed G Block), 90 MHz in the 1.7/2.1 GHz AWS band, 70 MHz in the 700 MHz band, and 73.5 MHz in the 2.5 GHz BRS band.²⁶

As the Commission considers allocating additional spectrum to accommodate future mobile broadband services, it should take into account several important considerations. First, it should focus on identifying additional spectrum between 400 MHz and 5 GHz. This is the range of spectrum that ITU has concluded is most suitable for mobile communications.²⁷ Spectrum bands below 5 GHz allow sufficient mobility, while also affording an acceptable trade-off between coverage and cost. In order to serve low-density areas, such as rural communities, spectrum below 2 GHz (even below 1 GHz) would be highly desirable, as these lower frequency bands require fewer cell sites, and thus, would be less costly to deploy.

Second, spectrum bands should be identified that provide large amounts of contiguous spectrum, as this facilitates the delivery of higher throughput data services and promotes greater network efficiency. The current LTE standard supports configurations up to 2 x 20 MHz, with peak data rates exceeding 100 Mbps.²⁸ Future enhancements to the standard (LTE-Advanced) are expected to support even larger contiguous blocks of spectrum with correspondingly higher

²⁶ *Task Force Report at 69.* The Task Force included the Educational Broadband Service (“EBS”) to conclude that a total stock of 534 MHz is currently available. While the EBS band may certainly be used to support broadband services, including through spectrum leases to commercial providers, licensing in the band is restricted to educational entities, and thus, does not meet the requirement for exclusively licensed, flexible use spectrum that Verizon Wireless believes is critical to support commercial mobile broadband services.

²⁷ Technical and Operational Information for Identifying Spectrum for the Terrestrial Component of Future Development of IMT-2000 and IMT-Advanced, Report ITU-R M.2079, at 6 (2006) (“ITU Technical Report”).

²⁸ Verizon Wireless, “LTE: The Future of Mobile Broadband Technology,” filed with *Verizon Wireless Innovation Comments*.

data rates.²⁹ Mr. Stone and other industry participants at the FCC's Broadband Workshop recommended that future spectrum allocations support a minimum band configuration of 2 x 20 MHz for each licensee.³⁰ In order to support multiple licensees – a desirable objective to promote competition as well increased production scale economies – new spectrum allocations should, ideally, provide a minimum of 80-120 MHz of contiguous spectrum (2 x 40/60 MHz).

Third, the identification of new spectrum allocations that are adjacent to, or at least in close proximity to, existing CMRS bands would provide opportunities to better leverage existing technology and network investments. For example, future reallocations of spectrum below 698 MHz might be able to leverage technology research and development that has already occurred, or will occur, in the 700 MHz band. Similarly, a reallocation of some portion of the 1755-1850 MHz band used by the federal government might leverage investments associated with the development of mobile systems operating in the 1850-1990 MHz PCS band or the 1710-1755 MHz AWS band.³¹ The FCC should not limit its review to bands that are adjacent to existing CMRS bands. Considering the amount of spectrum that experts believe is required for the future, the FCC's spectrum search should be exhaustive. However, a more immediate examination of spectrum bands in close proximity to existing CMRS bands may be warranted, as those may represent the best opportunities for bringing new spectrum to the marketplace quickly.

²⁹ Third Generation Partnership Project ("3GPP"), "3GPP Partners Propose LTE-Advanced Radio Technology," press release available at <http://www.3gpp.org/3GPP-Partners-propose-IMT-Advanced>.

³⁰ *Stone Testimony*. See also Testimony of Kris Rinne, Senior Vice President, Architecture and Planning, AT&T, Inc., FCC's Broadband Workshop on Spectrum, September 17, 2009, available at http://www.broadband.gov/ws_spectrum.html.

³¹ Verizon Wireless acknowledges that the reallocation of federal government spectrum is not within the authority of the Commission. However, we strongly encourage the Commission to work closely with NTIA to identify every possible opportunity to identify suitable spectrum for commercial use.

Fourth, the Commission should make every effort to identify spectrum that is (or can be) globally harmonized, to the greatest extent possible. Historically, this has been a difficult task, as administrations around the world have different spectrum priorities. However, the benefits of global harmonization, coupled with the standardization of wireless technologies, are significant. Besides enabling more seamless roaming between the United States and other parts of the world, global harmonization is critical in driving greater economies of scale. The telecommunications market is vastly different than it was twenty, or even ten, years ago. It is a global market, with manufacturers around the world selling their equipment in the U.S. and elsewhere. Establishing technology standards and harmonizing spectrum uses across the world enables manufacturers to build equipment that addresses market needs in the United States, as well as many other nations around the world. Harmonization is obviously important for companies like T-Mobile and Verizon Wireless which are owned (in whole or in part) by non-U.S. companies. However, the scale economies associated with harmonization ultimately benefit all carriers by driving down the price of telecommunications equipment. Table 2 summarizes those spectrum bands that have been identified globally for advanced mobile services (including 3G and 4G), and indicates which bands (or portions of bands) are currently available in the United States. For those bands not currently available for mobile broadband on an exclusively licensed, flexible use basis, the Commission should give careful consideration to whether, and under what timeframe, they could be made available.

Table 2. Global Spectrum Harmonization

Spectrum Identified Globally³²	Spectrum Allocated/Licensed in U.S. for CMRS
450-470 MHz	None
698-806 MHz (790-806 MHz in Regions 1 and 3)	698-746 MHz (Lower 700 MHz) 746-757 MHz / 776-787 MHz (Upper 700 MHz)
806-960 MHz (806-902 MHz in Region 2) (928-960 MHz in Region 2)	816-821 MHz / 861-866 MHz (SMR)* 824-849 MHz / 869-894 MHz (Cellular) 896-901 MHz / 935-940 MHz (SMR)*
1710-1885 MHz	1710-1755 MHz (AWS Uplink)
1885-2025 MHz	1850-1915 MHz / 1930-1995 MHz (PCS, incl. G Blk)
2110-2200 MHz	2110-2155 MHz (AWS Downlink)
2300-2400 MHz	None
2500-2690 MHz	2496-2502, 2602-2614 & 2618-2673.5 MHz (BRS) 2502-2568, 2572-2602 & 2673.5-2690 MHz (EBS)*
3400-3600 MHz	None

* Spectrum not available for exclusive licensing & flexible use.

Region 1: Europe, Africa, Middle East, Russia, CIS

Region 2: Americas

Region 3: Asia-Pacific

Finally, the Commission should consider the impacts on those incumbent services that reside in any spectrum bands considered for repurposing. Those impacts are likely to vary considerably. However, we urge the Commission not to casually dismiss candidate bands simply because they might appear difficult to repurpose, or have historically been viewed as off-limits. The Commission, as well as NTIA, must be diligent in its efforts to identify additional spectrum,

³² See 47 C.F.R. §2.106.

while being creative in finding ways to also accommodate incumbent services. Attaining the goal of allocating new spectrum is simply too important to the future of mobile broadband.

3. Key Issues In Moving Spectrum To Its Highest And Best Use

The Spectrum Public Notice asks what steps it should take in managing the spectrum to ensure that efficiency is maximized and that spectrum not efficiently used is moved to a higher and better use. Verizon Wireless believes that the most important step the Commission can take to promote greater spectrum efficiency is to allocate more spectrum for exclusive use licensing with full flexibility of use. The application of such a policy framework to spectrum bands used for CMRS has been the principle driver behind the phenomenal growth of the wireless industry and the reason why these bands (e.g., cellular and PCS) are commonly viewed as being used more efficiently and more intensively than other spectrum bands.

By granting licensees exclusive use of their assigned spectrum and the “flexibility to determine the types of services and the technologies and technical implementation designs used to provide those services,”³³ the Commission has fostered highly efficient and innovative use of spectrum. Economists have consistently endorsed Commission efforts to provide licensees with strong and flexible rights in the form of geographic licenses that can be purchased at auction and traded on the secondary market,³⁴ as it is through such policies that the Commission can ensure that spectrum is put to its highest and best use.³⁵

³³ *Establishment of an Interference Temperature Metric to Quantify and Manage Interference and to Expand Available Unlicensed Operation in Certain Fixed, Mobile and Satellite Frequency Bands*, Notice of Inquiry and Notice of Proposed Rulemaking, 18 FCC Rcd 25309, ¶ 6 (2003).

³⁴ *See, e.g.*, Ronald Coase, *The Federal Communications Commission*, 2 J.L. & Econ. 1 (1959); Arthur S. De Vany et al., *A Property System for Market Allocation of the Electromagnetic Spectrum*, 21 Stan. L. Rev. 1499 (1969); Douglas Webbink, *Radio Licenses and Frequency Spectrum Use Property Rights*, Comm. & The Law 4 (1987); Gregory Rosston and

The Commission's policy of granting exclusive and transferable flexible use rights to CMRS licensees has fostered investment and the development of innovative products and services.³⁶ This exclusive use licensing model has provided carriers with a powerful incentive to upgrade technology to increase the quality of their services and to expand the number of users and devices that communicate on their spectrum.³⁷

Jeffrey Steinberg, *Using Market-Based Spectrum Policy to Promote the Public Interest*, 50 Fed. Comm. L.J. 87 (1997); Thomas Hazlett, *The Wireless Craze, the Unlimited Bandwidth Myth, the Spectrum Auction Faux Pas, and the Punchline to Ronald Coase's 'Big Joke': An Essay on Airwave Allocation Policy*, 14 Harv. J.L. & Tech. 335 (2001); Hazlett and Spitzer Interference Temperature Comments; William Baumol and Dorothy Robyn, *Toward an Evolutionary Regime for Spectrum Governance: Licensing or Unrestricted Entry?* (2006); Gerald Faulhaber, *The Future of Wireless Communications: Spectrum as a Critical Resource*, 18 Info. And Econ. Policy 256 (2006).

³⁵ Reed Hundt, Chairman, Federal Communications Commission, Address at the CTIA Wireless 1997 Convention and Exposition (Mar. 4, 1997) ("We should get spectrum into the private market in a measured but steady way. We should let licensees use it flexibly, with easy transferability and no artificial build-out requirements, channel loading rules, or efficiency standards."); Reed Hundt, Chairman, Federal Communications Commission, *The Hard Road Ahead – An Agenda for the FCC in 1997* (Dec. 26, 1996) ("Spectrum should be put to its most valued use. The Commission should trust markets to assure this result, although we should act as the "register of deeds" for spectrum licenses – maintaining information as to which firms hold what licenses. Auctions allow markets to determine who will use the spectrum. We should also rely on markets to determine how the spectrum will be used. The Commission should move away from the old top-down, central planning approach of the past towards a decentralized approach that allows the spectrum licensee, rather than the government, to determine how spectrum will be used. . . . [i]n my view our spectrum policy should, to the greatest extent possible, permit open entry, allow maximum technical and service flexibility, promote innovation and facilitate seamless networks so that spectrum is rapidly deployed to provide the greatest public benefits.").

³⁶ See, e.g., Thomas W. Hazlett, *A Law and Economics Approach to Spectrum Property Rights: A Response to Weiser and Hatfield*, 15 Geo. Mason L. Rev. 975, 1005 (2008) ("With broad, exclusive spectrum rights, de facto owners invest aggressively in wireless infrastructure complementary to their airwaves and then promote intense utilization of the opportunities thereby afforded. . . . [f]irms do not bid billions of dollars for licenses to obtain 'exclusive use,' but to exercise 'exclusive rights' so as to enable diverse non-exclusive spectrum access for subscribers, application providers, technology suppliers, and rival networks.").

³⁷ Comments of Verizon Wireless, ET Docket No. 03-237, at Exhibit A, *Declaration of Dr. Charles Jackson Regarding Limits to the Interference Temperature Concept* (Apr. 5, 2004) at 16.

As Verizon Wireless has previously noted, CMRS licensees “have made multi-billion dollar investments in spectrum, R&D, and networks that have spurred innovation and created a robust market for wireless services.”³⁸ As a result, the wireless industry now provides robust digital voice and data services to 270 million customers in the U.S. on hundreds of devices.³⁹ Moreover, wireless companies, including Verizon Wireless, plan further upgrades and implementation of new technologies, and significant investment will be required to achieve these ends. Verizon Wireless, AT&T, Cox Communications, and MetroPCS, for example, have all announced plans to deploy next-generation networks based on LTE that will promote continued growth of broadband services.⁴⁰ Because of the Commission’s flexible, exclusive use regulatory approach for wireless, these developments can occur swiftly in response to marketplace forces rather than requiring governmental intervention.

As the Commission considers making additional spectrum available for future use, it should make such spectrum available based on its exclusive use model and through its established open auction process. Indeed, moving more commercial spectrum to an exclusive use model should be a principle objective of the Commission, regardless of whether or not these

³⁸ Comments of Verizon and Verizon Wireless on a National Broadband Plan, GN Docket No. 09-51 (June 8, 2009) at 72.

³⁹ *Id.*

⁴⁰ See Press Release, Verizon Wireless, *Verizon Selects LTE As 4G Wireless Broadband Direction, Technology Platform to be Trialed in 2008* (Nov. 29, 2007), available at <http://news.vzw.com/news/2007/11/pr2007-11-29.html>; Marin Perez, *MetroPCS Chooses LTE For 4G Wireless Network*, InformationWeek, Aug. 13, 2008, available at <http://www.informationweek.com/story/showArticle.jhtml?articleID=210003630>; Press Release, AT&T, *AT&T Acquires Key Spectrum To Set Foundation For Future Of Wireless Broadband, More Choices For Customers* (Apr. 3, 2008), available at <http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=25428>; Press Release, Cox Communications, *Cox to Launch Next Generation Bundle with Wireless in 2009* (Oct. 27, 2008), available at http://media.corporate-ir.net/media_files/irol/76/76341/release102708.pdf.

bands are ultimately used for mobile broadband or for other commercial purposes, as this provides the best mechanism for ensuring that spectrum is put to its highest and best use.

Verizon Wireless urges the Commission to undertake a targeted spectrum inventory that would examine all spectrum in the range of 400 MHz to 5 GHz that is not already allocated for exclusive use, and consider reallocating significant portions of these bands for future mobile broadband use. We expect such an inventory will reveal that many bands are not used efficiently. However, despite their inefficient use, some of these bands may accommodate services that represent significant value to the public. As a result, making reallocation decisions based on spectrum efficiency alone is probably not appropriate. There is no single formula that the Commission could use to assess the value of one band versus another or one service versus another, in order to make objective reallocation decisions. Each circumstance is likely to be different. However, identifying spectrum for mobile broadband that satisfies the criteria described above is critical. Moreover, even services that make efficient use of their current spectrum or that provide public interest benefits that trump spectrum efficiency might be able to be accommodated in other spectrum (or in other ways). We urge the Commission to be flexible and forward-thinking in conducting its spectrum inventory and implementing its reallocation decisions. Spectrum allocation decisions should not be made based solely on what's easiest to accomplish in the near term, but what's best for the nation over the long term.

IV. THE COMMISSION MUST ACT IMMEDIATELY TO CLEAR 700 MHz

On August 21, 2008, the Commission released a *Notice of Proposed Rulemaking and Order* which proposed to modify the Commission's rules to make clear that the operation of wireless microphones and other low power auxiliary stations will not be permitted in the 698-806 MHz ("700 MHz") band after television stations are transitioned to digital technology on

February 17, 2009 (“DTV transition date”).⁴¹ This proposal was made in support of the Commission’s previous conclusion that it is required to “take all steps necessary to make this spectrum effectively available both to public safety as well as commercial wireless services,”⁴² and the Commission’s tentative conclusion in the NPRM that harmful interference would be caused to both public safety and commercial systems if operation of wireless microphones were to continue.⁴³ There was broad support for the Commission’s proposal.⁴⁴ In fact, no party to this proceeding has disputed the potential for harmful interference or opposed the Commission’s conclusion that the band must be cleared of wireless microphones and similar devices.

The DTV transition has come and gone. While it required significant resources from the Commission, NTIA, television broadcasters, set-top box manufacturers and many others to pull it off, it was successfully completed on June 12, 2009. And yet, despite a four month delay of the DTV transition date, wireless microphones were still in the band when the transition was completed. Today, an additional four months has passed – eight months since the Commission’s original proposed date for clearing the band and fourteen months since wireless microphone users, manufacturers and others were put on notice of the impending deadline – and yet, wireless

⁴¹ *In the Matter of Revisions to Rules Authorizing the Operation of Low Power Auxiliary Stations in the 698-806 MHz Band (WT Docket No. 08-166)*, Notice of Proposed Rulemaking and Order (“NPRM”), FCC 08-188 (rel. Aug. 21, 2008).

⁴² *In the Matter of Service Rules for the 698-746, 747-762 and 777-792 MHz Bands (WT Docket No. 06-150)*, Report and Order and Further Notice of Proposed Rulemaking (“700 MHz First Report and Order”), FCC 07-72 (rel. Apr. 27, 2007) at ¶ 2.

⁴³ NPRM at ¶ 2.

⁴⁴ See e.g., *Comments of the Association of Public-Safety Communications Officials, Inc.* (“APCO”) in response to NPRM, filed Oct. 3, 2008; *Comments of the National Public Safety Telecommunications Council* (“NPSTC”) in response to NPRM, filed Oct. 3, 2008; *Comments of the Society of Broadcast Engineers, Incorporated*, in response to NPRM, filed Oct. 3, 2008; *Reply Comments of CTIA – The Wireless Association*, in response to NPRM, filed Oct. 20, 2008.

microphones still remain in the band. In fact, while Verizon Wireless and other 700 MHz licensees spend substantial financial and other resources to prepare for deployment of new advanced mobile systems, there continues to be considerable uncertainty about when the band will be available for use because the Commission has failed to issue an order requiring the band to be cleared.

Access to the 700 MHz band is critical in promoting increased broadband availability for American consumers, and in enabling more advanced communications for public safety. It is untenable that 700 MHz licensees, including some that paid billions of dollars for access to spectrum, should suffer from continued delay and uncertainty. Consistent with the Chairman's commitment to remove obstacles to 4G deployment, Verizon Wireless urges the Commission to act promptly to issue an order that requires all wireless microphones to cease operation in the 700 MHz band by the end of February 2010.

V. CONCLUSION

We concur with the conclusions reached by the FCC's Broadband Task Force and various industry experts that the convergence of wireless mobility and broadband Internet access has resulted in the substantial growth of mobile broadband services, that this growth can be expected to accelerate at an even more rapid pace in the future, and that there is a need for additional spectrum allocations as a result. Consequently, we urge the Commission to act promptly to undertake a targeted spectrum inventory, as outlined above, and to make every effort to identify additional spectrum for future use. Failure to do so risks stalling the continued growth of mobile broadband products and services in the United States, foregoing the significant economic and public benefits associated with such products and services, and falling behind those nations that compete with the United States in the global economy. In addition, Verizon Wireless urges the Commission to remove current obstacles to 4G deployment by immediately issuing an order that requires all wireless microphones to vacate the 700 MHz band by the end of February 2010.

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October 23, 2009