

**Before the
National Telecommunications and Information Administration
Washington, DC 20230**

In the Matter of)	
)	
Developing a Sustainable Spectrum Strategy for)	Docket No. 181130999-8999-01
America's Future)	RIN 0660-XC044
)	

COMMENTS OF T-MOBILE USA, INC.

Steve B. Sharkey
John Hunter
Christopher Wiczorek

T-MOBILE USA, INC.
601 Pennsylvania Avenue, N.W.
Suite 800
Washington, DC 20004
(202) 654-5900

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T-Mobile USA, Inc. (“T-Mobile”)^{1/} submits the following in response to the National Telecommunications and Information Administration’s (“NTIA”) request for comment^{2/} on a comprehensive and long-term national spectrum strategy, pursuant to the Presidential Memorandum, *Developing a Sustainable Spectrum Strategy for America’s Future*.^{3/} T-Mobile welcomes the Administration’s interest in and commitment to developing an effective long-term spectrum strategy that makes the most effective use of a limited national resource. In order to most effectively promote Fifth Generation (“5G”) and future wireless networks and services, NTIA should develop a national spectrum strategy that promotes reliable access to sufficient spectrum for exclusive licensed commercial use. 5G technology will utilize much wider bandwidths and require far greater amounts of spectrum than previous generations of mobile

^{1/} T-Mobile USA, Inc. is a wholly-owned subsidiary of T-Mobile US, Inc., a publicly traded company.

^{2/} Request for Comments, *Developing a Sustainable Spectrum Strategy for America’s Future*, 83 FR 65640 (Dec. 21, 2018), available at <https://www.govinfo.gov/content/pkg/FR-2018-12-21/pdf/2018-27690.pdf> (“Request for Comments”).

^{3/} Memorandum for the Heads of Executive Departments and Agencies, *Developing a Sustainable Spectrum Strategy for America’s Future*, 83 FR 54513 (Oct. 30, 2018), available at <https://www.govinfo.gov/content/pkg/FR-2018-10-30/pdf/2018-23839.pdf> (“*Developing a Sustainable Spectrum Strategy*”).

broadband to provide the extreme data speeds and volume needed to support applications, such as 4K video, virtual reality, augmented reality and widely deployed Internet of Things. It will need the reliability to support services that require high reliability, such as remote surgery, autonomous vehicles and drones. It must have the breadth and depth to support services in remote areas of the country and the densest urban areas to serve a generation of devices that require ubiquitous connectivity. Meeting the diversity of demands will require a spectrum strategy that provides a sufficient supply of high, mid- and low-band than was necessary to implement earlier generations of wireless technology and the national spectrum strategy should reflect that imperative.

I. INTRODUCTION

T-Mobile, including the MetroPCS brand, offers nationwide wireless voice, text, and data services to over 79 million subscribers.^{4/} In the fourth quarter of 2018, T-Mobile added 1.6 million net customers – marking 23 straight quarters of adding more than 1 million customers every quarter.^{5/} T-Mobile also saw continued growth in postpaid phone customers – with 1 million postpaid net additions, which is expected to be T-Mobile’s best quarterly performance in four years^{6/} – and continued success at MetroPCS.^{7/} T-Mobile’s ability to continue to sustain this growth and serve consumers and businesses is tied to its ability to access exclusive licensed spectrum. And because, as Congress has directed, spectrum available for commercial providers

^{4/} See *T-Mobile Posts Its Best Customer Results Yet, Reports Lowest Ever Q4 Postpaid Phone Churn, Beats Customer Guidance for FY 2018* (Jan. 9, 2018), <https://investor.t-mobile.com/news-and-events/t-mobile-us-press-releases/press-release-details/2019/T-Mobile-Posts-Its-Best-Customer-Results-Yet-Reports-Lowest-Ever-Q4-Postpaid-Phone-Churn-Beats-Customer-Guidance-for-FY-2018/default.aspx>.

^{5/} See *id.*

^{6/} See *id.*

^{7/} See *id.*

like T-Mobile will depend, in part, on the government identifying spectrum for terrestrial mobile wireless use, T-Mobile is interested in NTIA's continued development of a spectrum strategy.^{8/}

Spectrum is not only a critical asset for commercial service providers, but it is also a key economic driver. For non-government spectrum users, access to spectrum – particularly spectrum that is internationally harmonized – will help facilitate 5G networks and applications. Globally, 5G will contribute an estimated \$12.3 trillion and 22 million jobs.^{9/} As occurred with the implementation of 4G, U.S. leadership in 5G will produce significant economic benefits across many sectors.^{10/}

Nevertheless, T-Mobile recognizes that additional spectrum is needed for both commercial and federal government use, and a successful spectrum strategy will require a careful balancing of interests between the two. There remain critical differences, highlighted below, between commercial and federal users that must inform NTIA's spectrum strategy. Most notably, commercial users must have reliable and consistent access to spectrum. Over-reliance on shared-spectrum systems, which may not provide that reliable access or which include technical limitations to accommodate sharing, will hobble commercial networks and potentially result in the U.S. falling behind in the race to 5G, particularly if other countries, as expected, will not condition 5G spectrum access on shared use.

^{8/} See Consolidated Appropriations Act of 2018, Division P, Repack Airwaves Yielding Better Access for Users of Modern Services Act of 2018, Pub. L. 115–141, § 603, 132 Stat. 1080 (2018) (“RAY BAUM’S Act”); Spectrum Pipeline Act of 2015, Pub. L. No. 114-74, § 1004, 129 Stat. 621 (2015) (“Spectrum Pipeline Act”).

^{9/} DAVID ABECASSIS, CHRIS NICKERSON, & JANETTE STEWART, GLOBAL RACE TO 5G – SPECTRUM AND INFRASTRUCTURE PLANS AND PRIORITIES 7 (2018), https://api.ctia.org/wp-content/uploads/2018/04/Analysys-Mason-Global-Race-To-5G_2018.pdf.

^{10/} See CTIA, THE NEXT GENERATION OF WIRELESS: 5G LEADERSHIP IN THE U.S. (2016), https://api.ctia.org/docs/default-source/default-document-library/5g_white-paper_web27df8479664c467a6bc70ff0000ed09a9.pdf.

II. RESPONSES TO INDIVIDUAL QUESTIONS

A. Stakeholders Should Have Predictable Access to Spectrum Capacity.

NTIA seeks comment on the ways in which the predictability of spectrum access could be improved.^{11/} Spectrum access takes two forms – (1) knowing when spectrum, not yet designated for a particular use, may become available in the future, and (2) knowing when users can access spectrum that has already been made available. Certainty across both forms of spectrum access is critical to promoting commercial communications networks.

The federal government has already taken useful steps to promote certainty in the first of these areas – knowing when spectrum not yet designated for a particular use will become available. The Federal Communications Commission (“FCC”) is expected to improve the predictability of spectrum access by providing information about when additional spectrum will be available for licensing. This is based on the Congressional directive in the 2018 Appropriations Act, which requires the FCC to annually publish a spectrum timetable that provides an estimate of the spectrum auctions and, to the extent such information is available, the frequency bands associated with such auctions, that will be initiated in the next year.^{12/}

Congress itself took similarly useful action in 2015 by enacting the Spectrum Pipeline Act, and in 2018 by enacting the MOBILE NOW Act, which appropriately direct the NTIA and the FCC to affirmatively make additional spectrum available for wireless communications and to evaluate additional opportunities to do so.^{13/} Similarly, NTIA regularly publishes reports to

^{11/} Request for Comments at 65641.

^{12/} 47 U.S.C. § 309(j)(18). *See also Estimate of Systems of Competitive Bidding For Fiscal Year 2019*, Public Notice, DA 18-997 (rel. Sept. 28, 2018).

^{13/} *See* Spectrum Pipeline Act, § 1004; RAY BAUM’S Act, § 603; 47 U.S.C § 1451.

make available additional spectrum for commercial use.^{14/} NTIA should supplement these efforts by continuing to evaluate spectrum that may be available for non-federal use and by making that evaluation public, along with potential timelines for spectrum reallocation.

T-Mobile is particularly encouraged by Assistant Secretary Redl's recent announcement that NTIA is considering the reallocation of the 3450-3550 MHz band.^{15/} As more information regarding that band becomes available, NTIA should make it available, so commercial providers can incorporate the potential availability of that spectrum into their deployment plans.

Predictability is equally important with respect to accessing already allocated spectrum. As explained further below with respect to automated shared access systems, commercial users cannot adequately plan for customer-required service levels if they do not have certainty about if and when spectrum will be available. In order to plan and invest in long-term deployments, wireless providers need access to a predictable and reliable amount of available spectrum in a geographic area. That means that shared spectrum cannot be available on an *ad hoc* basis. The national spectrum strategy should therefore encourage NTIA to make spectrum available for commercial use on an exclusive basis, where possible, consistent with Congressional directive.^{16/}

^{14/} See *Sixth Interim Progress Report on the Ten-Year Plan and Timetable*, NTIA (June 2016), https://www.ntia.doc.gov/files/ntia/publications/ntia_6th_interim_progress_report_on_ten-year_timetable_june_2016.pdf; *Developing a Sustainable Spectrum Strategy*, Sec. 3.

^{15/} David J. Redl, *NTIA Identifies 3450-3550 MHz for Study as Potential Band for Wireless Broadband Use*, NTIA (Feb. 26, 2018), <https://www.ntia.doc.gov/blog/2018/ntia-identifies-3450-3550-mhz-study-potential-band-wireless-broadband-use> (“*NTIA Identifies 3450-3550 MHz for Study*”).

^{16/} 47 U.S.C. § 923(j)(1) (“In evaluating a band of frequencies for possible reallocation for exclusive non-Federal use or shared use, the NTIA shall give priority to options involving reallocation of the band for exclusive non-Federal use and shall choose options involving shared use only when it determines, in consultation with the Director of the Office of Management and Budget, that relocation of a Federal entity from the band is not feasible because of technical or cost constraints.”); Section 603(a)(6) of RAY BAUM’S Act (titled “Relocation prioritized over sharing.”).

B. Over-Reliance on Automated Spectrum Sharing Would Stifle Wireless Growth.

NTIA seeks comment on the extent to which the introduction of automation would facilitate the assessment of spectrum use and expedite the coordination of shared access.^{17/}

T-Mobile agrees that automation can expedite and facilitate shared access and is therefore useful in some circumstances. Nevertheless, access to exclusively-licensed spectrum is the best way to ensure investment by wireless communications providers. Investment by wireless providers in exclusive licensed spectrum has made the U.S. the world's wireless industry leader, facilitated the creation of networks capable of supporting greater speeds and functionalities, and led to new, more powerful, and more sophisticated devices. Exclusive licensed spectrum is also a critical driver of the nation's economy – for instance, every 10 megahertz of spectrum made available adds \$3 billion to the U.S. Gross Domestic Product and supports approximately 105,000 new jobs.^{18/}

Exclusive licensed spectrum is critical to wireless providers because dynamic use of spectrum is antithetical to the network planning in which wireless providers engage. Wireless providers carefully evaluate the channels they use in a particular place and time in order to optimize and make the most efficient use of their spectrum resources. Automation introduces complications associated with instantaneously retuning equipment to newly assigned spectrum and lowers the overall efficiency of spectrum use, reducing carriers' ability to meet the rapidly increasing demand for data. Similarly, the uncertainty of being able to access spectrum would

^{17/} Request for Comments at 65641.

^{18/} See CTIA, LICENSED SPECTRUM: THE KEY TO CONTINUING AMERICA'S WIRELESS LEADERSHIP AND GROWING OUR ECONOMY 5 (Feb. 2017), <https://api.ctia.org/docs/default-source/default-document-library/ctia-white-paper-licensed-spectrum.pdf>.

depress the development of a robust equipment market. An automated database – even when it operates efficiently – is always a second-best choice for commercial providers.

In some circumstances, an automated database may be the best approach, but use of that tool should be limited to situations where it is necessary. For example, the FCC recently adopted rules governing database-driven access to the 3.5 GHz band.^{19/} Those rules represent a compromise of competing interests and allow the band to be shared to accommodate a diverse range of services. While the Commission recently took action to dramatically improve the utility of the band by adopting rules that provide greater certainty to access the spectrum, the shared structure of the band comes with technical and regulatory constraints that limit its use for mobile 5G services.^{20/} This band is a central focus of the global race for 5G, and the U.S. is disadvantaged in that race by the shared nature of the band. While some U.S. policy makers have been captivated by new approaches to sharing, the reality is that dynamic spectrum sharing remains untested in the 3.5 GHz band or elsewhere.^{21/}

Even if there was more experience with shared spectrum access, its use should also be avoided because of international considerations. Those factors are notable for the 3.5 GHz band, where U.S. rules – while reasonable under the circumstances – will constrain the use of the band for 5G, while in other countries, the band can form the basis of 5G networks.^{22/}

^{19/} See *Promoting Investment in the 3550-3700 MHz Band*, Report and Order, FCC 18-149 (rel. Oct. 24, 2018).

^{20/} *Id.*

^{21/} There also has not been any demonstrable evidence of successful sharing in the 600 MHz white space spectrum either. See *Amendment of Part 15 of the Commission's Rules for Unlicensed White Space Devices*, Notice of Proposed Rulemaking and Order, 31 FCC Rcd 1657 (2016); *Unlicensed Operation in the TV Broadcast Bands*, Second Report and Order and Memorandum Opinion and Order, 23 FCC Rcd 16807 (2008).

^{22/} For example, Ireland and the United Kingdom, which have moved more quickly than the U.S., have already auctioned spectrum between 3.4 and 3.8 GHz to mobile operators. Commission for

U.S. over-reliance on shared spectrum access will not only hinder 5G deployment, but it will impact global harmonization of spectrum use, which should continue to be a national priority. Global spectrum harmonization for 5G deployments will be beneficial for the mobile wireless ecosystem. Global harmonization creates efficiencies and economies of scale and scope in equipment and technology development that will lead to a more robust spectrum architecture, in 5G networks and in the future, for U.S. consumers and businesses.

As noted above, NTIA is currently evaluating the potential use of the 3.45-3.55 GHz band for commercial wireless broadband operations.^{23/} This band has the potential to provide much needed mid-band spectrum for 5G use down the road. Importing the 3.5 GHz band's sharing mechanisms to that band will not only impede its utility, in the same way the 3.5 GHz band is limited, but it will also thwart global harmonization of the band. Instead, rules for the band and all other spectrum bands that are made available for commercial use should be consistent with global approaches.

C. Industry-Driven Standards Promote Efficient and Effective Spectrum Use.

NTIA seeks comment on the practical extent to which standards can promote effective spectrum use.^{24/} In the wireless sector, as is widely recognized by this Administration, industry-

Communication Regulation, *Results of the 3.6 GHz Band Spectrum Award*, Information Notice, ComReg 17/38 (May 22, 2017), https://www.comreg.ie/media/dlm_uploads/2017/05/ComReg-1738.pdf; Ofcom, *Award of 2.3 and 3.4 GHz Spectrum Bands - Publication under Regulation 111 of the Wireless Telegraphy (Licence Award), Regulations 2018 of Results of Auction* (Apr. 13, 2018). Italy auctioned licenses in the 3.6-3.8 GHz band in 2018. See Juan Pedro Tomás, *Italian Government Raise \$7.5 Billion in 5G Auction*, RCRWireless (Oct. 3, 2018), <https://www.rcrwireless.com/20181003/5g/italian-government-raises-billion-5g-auction>. Australia notified incumbents and fixed licensees in the 3.7-4.2 GHz band that it may review use of the band for mobile broadband operations. Australian Communications and Media Authority, *Future Use of the 3.6 GHz Band – Decisions and Preliminary Views*, 41 (Oct. 2017), https://www.acma.gov.au/theACMA/future-approach-to-the-3_6-ghz-band.

^{23/} See NTIA Identifies 3450-3550 MHz for Study.

^{24/} Request for Comments at 65641.

led efforts, rather than government-imposed mandates, generally lead to the efficient and effective use of spectrum.^{25/} Therefore, the federal government should play a supporting rather than leadership role to promote standards and should continue to closely monitor those activities to ensure that standards bodies operate in a fair and transparent manner. The 3rd Generation Partnership Project (“3GPP”), a collaborative consortium of the world’s leading telecommunications and technology companies and standards organizations, has been the frontrunner in developing wireless standards and specifications,^{26/} including standards for 5G.^{27/}

^{25/} See, e.g., Remarks of David J. Redl, Assistant Secretary for Communications and Information, NTIA, White House 5G Summit (Sept. 28, 2018), <https://www.ntia.doc.gov/speecchtestimony/2018/remarks-assistant-secretary-redl-white-house-5g-summit> (“I’ll briefly mention a couple of additional areas that will be highlighted today in which collaboration between government and industry is vital – and where NTIA is playing an important role. The first is our efforts to support industry-led development and refinement of the global standards that already have begun to define how 5G will unfold.”); Remarks of David J. Redl, Assistant Secretary for Communications and Information, NTIA, CTIA’s Race to 5G Summit (Apr. 19, 2018), <https://www.ntia.doc.gov/speecchtestimony/2018/remarks-assistant-secretary-redl-ctias-race-5g-summit> (“There is no question the federal government has a vested interest in 5G networks being made secure. Having said that, I believe the most effective 5G security strategy will revolve principally around industry-driven standards work.”); Remarks of David J. Redl, Assistant Secretary for Communications and Information, NTIA, State of the Net 2018 (Jan. 29, 2018), <https://www.ntia.doc.gov/speecchtestimony/2018/remarks-assistant-secretary-redl-state-net-2018> (“Commerce has led the U.S. government when it comes to new and emerging technologies. But that leadership requires continued engagement from American industry, and from all of you. In order to ensure that American entrepreneurs are able to take risks and to find global markets for their digital products and services, we need to make sure that we’re charting the right path. On such issues as . . . 5G, we’re looking for industry to help us make the right choices as a government.”).

^{26/} *About 3GPP Home*, 3GPP, <http://www.3gpp.org/about-3gpp/about-3gpp>; Patrick Moorhead, *The Crucial Role of Wireless Industry Standards in 5G*, FORBES (Sept. 1, 2017, 3:10 PM), <https://www.forbes.com/sites/patrickmoorhead/2017/09/01/the-crucial-role-of-wireless-industry-standards-in-5g/#25242f772cff> (“The 3GPP specification is the foundation upon which the entire industry builds upon and is crucial for the entire mobile ecosystem. Without the hard work of the numerous 3GPP members and their innovation, collaboration, and testing, we simply wouldn’t have ubiquitous connectivity like we have today. This will become even more important as the industry starts to move towards 5G technologies and the different markets that 5G will address.”).

^{27/} *Release 15*, 3GPP (July 16, 2018), <http://www.3gpp.org/release-15>.

The FCC and industry rely on and reference the 3GPP for standards guidance.^{28/} With respect to wireless network security, CTIA has convened a Cybersecurity Working Group that consists of wireless providers, equipment manufacturers, and applications companies to provide the wireless industry with best practices and guidance. T-Mobile supports these approaches. And, as T-Mobile has pointed out, approval of its proposed transaction with Sprint will strengthen the U.S. position in the development and deployment of 5G technology.^{29/}

However, to the extent that the government allows private industry to develop standards or relies on those standards itself, it should ensure that the group's output is based on a consensus-based approach, in which no entity has an ability to dominate the potential outcome. This is particularly important where intellectual property rights are provided by countries that may represent a security risk to the U.S. As the U.S. has recognized, embedded software may provide a "backdoor" to wireless networks, causing them to become compromised.^{30/} Any standards must ensure that those backdoors do not exist and security vulnerabilities are minimized in 5G wireless networks.

In addition, the federal government should continue to seek opportunities to create a regulatory structure that is conducive to investment and technology leadership. Standards bodies are driven by member contributions, and the countries that take action to promote investment in

^{28/} See, e.g., *Promoting Investment in the 3550-3700 MHz Band*, Report and Order, FCC 18-149, n. 474, ¶ 137 (rel. Oct. 24, 2018); *Expanding Flexible Use of the 3.7 to 4.2 GHz Band, et al.*, Order and Notice of Proposed Rulemaking, 33 FCC Rcd 6915, n. 304 (2018).

^{29/} *Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of the Licenses and Authorizations*, WT Docket No. 18-197, Description of Transaction, Public Interest Statement, and Related Demonstrations (filed June 18, 2018).

^{30/} See *Protecting Against National Security Threats to the Communications Supply Chain Through FCC Programs*, Notice of Proposed Rulemaking, 33 FCC Rcd 4058 (2018) (statement of Chairman Ajit Pai); see also https://api.ctia.org/wp-content/uploads/2018/07/ProtectingAmericasNetworks_FINAL.pdf.

technology and services will lead the race. As discussed above, timely access to exclusive licensed spectrum is a core tenet of such a structure.

D. Investment in RDT&E Will Improve Spectrum Access.

NTIA seeks comment on how additional investment in research, development, testing, and evaluation (“RDT&E”) could enhance spectrum utilization methods and sharing tools.^{31/} Federal agency investment in RDT&E is critical to improving spectrum utilization methods and advance standards leadership, particularly in light of changes in the U.S. industrial telecommunications sector.^{32/} However, those improved spectrum utilization techniques can and should lead not only to spectrum sharing but, as noted above and consistent with Congressional directive, also to spectrum reallocation.

The Spectrum Relocation Fund (the “Fund”) has provided a valuable avenue for federal entities to access funding for RDT&E. Since the Spectrum Pipeline Act of 2015 broadened the scope of eligible expenses for which agencies can request funding,^{33/} the Fund has been used for important RDT&E activities.^{34/} Notably, work is now being performed in the Federal Aviation Administration, Department of Defense, Department of Homeland Security, and National Oceanic and Atmospheric Administration’s cross-agency Spectrum Efficient National Surveillance Radar (“SENSR”) program.^{35/} Using the proceeds from spectrum auctions, the

^{31/} Request for Comments at 65640.

^{32/} The consolidation of U.S. telecommunications manufacturers, such as Bell Laboratories and Lucent Technologies, has caused a significant amount of research and development activities to be relocated out of the U.S. *See History*, Nokia Bell Labs, <https://www.bell-labs.com/about/history-bell-labs/>. This has led to U.S. reliance on non-U.S.-based vendors.

^{33/} 47 U.S.C. § 928; Spectrum Pipeline Act, § 1005.

^{34/} COMMERCIAL SPECTRUM ENHANCEMENT ACT: ANNUAL PROGRESS REPORT FOR 2017, NTIA (June 2018), https://www.ntia.doc.gov/files/ntia/publications/csea_2017_report_june_2018.pdf.

^{35/} *Fact Sheet – Spectrum Efficient National Surveillance Radar (SENSR)*, FAA (June 2, 2017), https://www.faa.gov/news/fact_sheets/news_story.cfm?newsId=21734 (“*SENSR Fact Sheet*”); *Spectrum*

agencies are working together to consolidate the multiple surveillance radar systems currently in operation into one integrated, multipurpose radar that will be used for air traffic management, weather predictions, homeland security and defense, and unmanned aircraft and airspace security operations.^{36/} The federal agencies in the SENSr program are also assessing whether to make a minimum of 30 megahertz of spectrum in the 1.3 GHz band, which is adjacent to spectrum already being used for commercial networks, available for commercial use.^{37/} Because investment in RDT&E produces a win-win for federal and non-federal stakeholders, NTIA should encourage its further use and Congress may wish to expand the scope of the funds available.

E. Economic Growth Depends on Winning the Race to 5G.

NTIA asks stakeholders to identify any risks related to the global competitiveness of the U.S. spectrum policy.^{38/} There are significant risks to U.S. industries if the U.S. does not take a leadership position in spectrum management and policy.^{39/} The U.S. was a leader in making spectrum available for 4G networks, both domestically and globally.^{40/} That led to the U.S.

Efficient National Surveillance Radar, RAYTHEON, <https://www.raytheon.com/capabilities/products/sensr>; *Spectrum Efficient National Surveillance Radar (SENSr) Guide*, RAYTHEON <https://www.raytheon.com/sites/default/files/capabilities/rtnwcm/groups/corporate/documents/content/sensr-infographic.pdf>; see also Shameeka Hunt, *Promoting a New Era of Electromagnetic Spectrum Repurposing*, CHIPS, <https://www.doncio.navy.mil/CHIPS/ArticleDetails.aspx?ID=10576>.

^{36/} *Id.*

^{37/} See *SENSr Fact Sheet*. Under the Spectrum Pipeline Act, the federal agencies are required to submit to make 30 megahertz of spectrum below 3 GHz available for auction by 2024. See 47 U.S.C. § 921.

^{38/} Request for Comments at 65640.

^{39/} CTIA, *THE GLOBAL RACE TO 5G* (2018), <https://api.ctia.org/wp-content/uploads/2018/04/Race-to-5G-Report.pdf> (“Losing the race to 5G could have a significant negative effect on America’s wireless industry and our broader economy.”) (“THE GLOBAL RACE TO 5G”).

^{40/} RECON ANALYTICS, *HOW AMERICA’S 4G LEADERSHIP PROPELLED THE U.S. ECONOMY* (2018), https://api.ctia.org/wp-content/uploads/2018/04/Recon-Analytics_How-Americas-4G-Leadership-

becoming the worldwide leader in the development of 4G networks and the applications that used those networks.^{41/} The current U.S.-based application-based economy was largely driven by those leadership efforts.

The U.S. should make similar efforts with respect to 5G, particularly based on the efforts already taken by China, South Korea and Japan.^{42/} The U.S. wireless industry is working to lead the development and deployment of 5G equipment and technology. T-Mobile is deploying 5G-ready equipment as it rolls out 600 MHz Extended Range LTE, which is already live in more than 1,500 cities and towns in 37 states and Puerto Rico.^{43/} And, approval of its proposed transaction with Sprint will be the fastest way to implement 5G in the U.S. The federal government must also do its part. As CTIA has noted, to maintain U.S. 5G leadership, “the federal government needs to move forward on releasing hundreds of [megahertz] of new spectrum.”^{44/} Winning the race to 5G would not only be beneficial for the wireless industry, but it is necessary also for the overall health of the U.S. economy.^{45/}

Propelled-US-Economy_2018.pdf. 4G networks cover 99.7% of all Americans. CTIA, THE STATE OF WIRELESS 2018 (2018), https://api.ctia.org/wp-content/uploads/2018/07/CTIA_State-of-Wireless-2018_0710.pdf (“THE STATE OF WIRELESS 2018”).

^{41/} *Id.*

^{42/} Press Release, *Industry Leaders Believe U.S. Must be a Global Leader in 5G Wireless for their Business to Stay Competitive*, CTIA (Oct. 24, 2017), <https://www.ctia.org/news/industry-leaders-believe-u-s-must-be-a-global-leader-in-5g-wireless-for-their-business-to-stay-competitive>; see THE GLOBAL RACE TO 5G.

^{43/} *One Step Closer to Nationwide 5G: T-Mobile Marks a World’s First on the Road to 5G*, T-MOBILE (Nov. 20, 2018), <https://www.t-mobile.com/news/first-600mhz-5g-test>; *T-Mobile Building Out 5G in 30 Cities This Year...and That’s Just the Start*, T-MOBILE (Feb. 27, 2018), <https://investor.t-mobile.com/news-and-events/t-mobile-us-press-releases/press-release-details/2018/T-Mobile-Building-Out-5G-in-30-Cities-This-Yearand-Thats-Just-the-Start/default.aspx>.

^{44/} THE GLOBAL RACE TO 5G.

^{45/} *Id.*

The U.S. must similarly continue to take a leadership position in international fora, like the International Telecommunications Union (“ITU”), to align international spectrum management with U.S. policy. The ITU’s decisions at 2019 World Radiocommunication Conference (“WRC-19”) will not only influence international spectrum policy, but will also be critical to spectrum used by U.S. consumers, businesses, service providers, and manufacturers. The full benefit of deploying spectrum for mobile use in the U.S. can best be realized by harmonizing the designation of spectrum internationally, which helps U.S. industry by creating global markets. Nevertheless, when international policy diverges from U.S. interests, the U.S. must still proceed with its domestic agenda. A good example is the 28 GHz band. The 2015 World Radiocommunication Conference invited the ITU to determine the spectrum needs for terrestrial systems in the bands between 24.25 GHz and 86 GHz for International Mobile Telecommunications designation, targeting among others, the 37-40.5 GHz, 40.5-42.5 GHz, and 42.5-43.5 GHz bands, but excluding the 28 GHz band.^{46/} In contrast, in its *Spectrum Frontiers* proceeding, the FCC made the 28 GHz band available for flexible wireless use in a new Upper Microwave Flexible Use Service,^{47/} and the band is currently being auctioned.^{48/} With the 28 GHz band, the FCC has created a meaningful additional opportunity for the deployment of spectrum that can be used for 5G networks despite international policy.

^{46/} Resolution 238 (WRC-15), https://www.itu.int/dms_pub/itu-r/oth/0c/0a/R0C0A00000C0014PDFE.pdf.

^{47/} *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services, et al.*, Report and Order and Further Notice of Proposed Rulemaking, 31 FCC Rcd 8014, ¶ 161 (2016).

^{48/} *See Auctions of Upper Microwave Flexible Use Licenses for Next-Generation Wireless Services*, Public Notice, FCC 18-43, ¶ 1 (2018).

F. A Spectrum Sharing Model Should Focus on Geographic Availability.

NTIA asks how to structure a spectrum management paradigm to meet both commercial and federal needs. A pragmatic approach should guide spectrum management so that federal needs are met while commercial spectrum is available to support 5G networks. As described above, for commercial entities, those needs must be satisfied by a stable and predictable spectrum environment.

That means that spectrum sharing cannot result in unpredictable spectrum availability for commercial use. While sharing along the time dimension may be challenging, industry has a successful record of sharing spectrum geographically where its use is not required for federal operations. The AWS-1 and AWS-3 bands are good examples of successful sharing models between federal and commercial interests. The FCC structured the AWS-1 and AWS-3 bands so that federal incumbent operations were protected from wireless licensees with the use of protection zones.^{49/} The FCC's approach in those bands is useful because federal needs are generally localized, while commercial needs are national. And, as technology develops, there may be an opportunity to reduce exclusion or sharing zones,^{50/} Any federal/non-federal sharing should focus on geographic sharing where spectrum cannot be reallocated on a nationwide basis for commercial operations.

^{49/} *The Federal Communications Commission and the National Telecommunications and Information Administration: Coordination Procedures in the 1695-1710 MHz and 1755-1780 MHz Bands*, Public Notice, 29 FCC Rcd 8527 (2014).

^{50/} See Letter from Paige R. Atkins, Associate Administrator, Office of Spectrum Management, NTIA, to Julius P. Knapp, Chief, Office of Engineering and Technology, FCC, GN Docket No. 12-354 (filed Mar. 24, 2015).

G. In the Next 15 Years, Terrestrial Networks Will Need Access to Additional Spectrum For Next Generation Wireless Services.

Wireless data use in the U.S. continues to skyrocket. In 2017, over 15 trillion megabytes of data was carried over wireless networks.^{51/} Consumer demand for wireless broadband has also increased dramatically, with “hundreds of millions of smartphones” and “over 180 connected devices in the U.S.” currently in operation.^{52/} These trends will likely continue, as the wireless industry “mov[es] from an industry that connects everyone to an industry that connects everything.”^{53/} To accommodate this growth, as much spectrum as possible must be made available over time for wireless services. Unlike previous generations of wireless technology, 5G will require significantly more spectrum – in the high-, mid-, and low-band ranges.^{54/} Identifying new spectrum opportunities is therefore important for the U.S. to maintain its leadership in 5G. Nevertheless, approval of T-Mobile’s transaction with Sprint is the most certain path to U.S. 5G leadership – rather than uncertain access to spectrum at an uncertain time in the future. The national spectrum strategy should be structured to meet these anticipated demands, generally by ensuring that there is sufficient spectrum designated for exclusive licensed use.

III. CONCLUSIONS

T-Mobile appreciates NTIA’s request for comments on a national spectrum strategy. In order to ensure the greatest opportunity for the wireless industry and the U.S. economy at large,

^{51/} THE STATE OF WIRELESS 2018. Each smartphone generates more than 5 GB of data each month. *Id.*

^{52/} ACCENTURE, HOW THE WIRELESS INDUSTRY POWERS THE U.S. ECONOMY 7 (2018), <https://api.ctia.org/wp-content/uploads/2018/04/Accenture-Strategy-Wireless-Industry-Powers-US-Economy-2018-POV.pdf>.

^{53/} THE STATE OF WIRELESS 2018.

the U.S. must maintain leadership of 5G, which can be accomplished by favoring access to exclusive licensed – rather than shared – spectrum for commercial providers.

Respectfully submitted,

/s/ Steve B. Sharkey

Steve B. Sharkey

John Hunter

Christopher Wieczorek

T-MOBILE USA, INC.

601 Pennsylvania Avenue, N.W.

Suite 800

Washington, DC 20004

(202) 654-5900

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^{54/} The FCC has previously noted the importance of making high-, mid-, and low-band spectrum available for the next generation of wireless technologies. *See Policies Regarding Mobile Spectrum Holdings*, Report and Order, 29 FCC Rcd 6133, ¶ 18 (“As providers deploy next-generation mobile networks, the engineering properties and deployment capabilities of the mix of particular spectrum bands in providers’ holdings have become increasingly important.”); *see also* FCC Commissioner Michael O’Rielly, *A Mid-Band Spectrum Win in the Making*, FCC (July 10, 2017, 2:30 PM), <https://www.fcc.gov/news-events/blog/2017/07/10/mid-band-spectrum-win-making> (“Next generation wireless networks will require high, mid and low band spectrum.”).