

**Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554**

In the Matter of)	
)	
Wireless Telecommunications Bureau)	
and Office of Engineering and Technology)	GN Docket Nos. 14-177, 15-319,
Seek Comment Pursuant)	17-183, and 17-258
to the Spectrum Pipeline Act of 2015)	
)	

COMMENTS OF FEDERATED WIRELESS, INC.

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September 11, 2018

EXECUTIVE SUMMARY

Federated Wireless is pleased to provide these comments on the effects of the Commission's rule changes establishing the spectrum sharing regime for the CBRS at 3550-3700 MHz and the opportunity for additional spectrum bands to be shared among incumbent users and new licensed and unlicensed users.

The effects of sharing in the CBRS band have been tremendously positive in the following respects: (1) CBRS frequencies are an integral component of 5G wireless technology worldwide, and by adopting and rapidly implementing a sharing framework for the CBRS, the Commission has maintained U.S. leadership in the global race to 5G, rather than waiting over a decade for legacy "clear and auction" approaches to realign use of the band; (2) the Commission's rules establishing the CBRS have fostered the development of a band that is a success on the verge of happening, with full commercialization imminent and immense demand evident for access to CBRS spectrum across the country and across industry sectors; (3) CBRS will provide robust broadband availability where it does not exist today and will generate material economic benefits; (4) commercial deployment of CBRS will prove the effectiveness and efficiency of the innovative tools the Commission used to create the CBRS opportunity – an opportunity that can be replicated in other bands; and (5) the spectrum landscape is replete with opportunities for sharing among incumbent and newly authorized licensed and unlicensed users, a move that will increase the efficiency and intensive use of scarce spectrum resources.

In the view of Federated Wireless, the positive experience gained from the CBRS band can be leveraged and applied to the following bands, which are ideal candidates for spectrum sharing: 3.7-4.2 GHz, 3.45-3.55 GHz, 3.1-3.45 GHz, 5.925-7.125 GHz, 26 GHz, 37 GHz, 70/80 GHz and 4.9 GHz.

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Federated Wireless, Inc. (“Federated Wireless”) is pleased to provide these comments in response to the public notice issued by the Federal Communications Commission (“Commission”) seeking information about the effects of establishing the spectrum sharing regime for the Citizens Broadband Radio Service (“CBRS”) at 3550-3700 MHz and the opportunity for additional spectrum bands to be shared among incumbent users and new licensed and unlicensed users.¹

As described more fully herein, the effects of sharing in the CBRS band have been tremendously positive in the following respects: (1) CBRS frequencies are an integral component of 5G wireless technology worldwide, and by adopting and rapidly implementing a sharing framework for the CBRS, the Commission has maintained U.S. leadership in the global race to 5G, rather than waiting over a decade for legacy “clear and auction” approaches to realign use of the band; (2) the Commission’s rules establishing the CBRS have fostered the development of a band that is a success on the verge of happening, with full commercialization imminent and

¹ *In the Matter of Wireless Telecommunications Bureau and Office of Engineering and Technology Seek Comment Pursuant to The Spectrum Pipeline Act of 2015*, GN Docket Nos. 14-177, 15-319, 17-183, and 17-258, Public Notice, DA 18-841 (WTB/OET rel. Aug. 10, 2018) (“Public Notice”).

immense demand evident for access to CBRS spectrum across the country and across industry sectors; (3) CBRS will provide robust broadband availability where it does not exist today and will generate material economic benefits; (4) commercial deployment of CBRS will prove the effectiveness and efficiency of the innovative tools the Commission used to create the CBRS opportunity – an opportunity that can be replicated in other bands; and (5) the spectrum landscape is replete with opportunities for sharing among incumbent and newly authorized licensed and unlicensed users, a move that will increase the efficiency and intensive use of scarce spectrum resources.

In the view of Federated Wireless, the positive experience gained from the CBRS band can be leveraged and applied to the following bands, which are ideal candidates for spectrum sharing: 3.7-4.2 GHz, 3.45-3.55 GHz, 3.1-3.45 GHz, 5.925-7.125 GHz, 26 GHz, 37 GHz, 70/80 GHz and 4.9 GHz.

I. THE RULE CHANGES THAT CREATED SPECTRUM SHARING IN THE CBRS HAVE LED TO RAPID DEPLOYMENT OF SPECTRUM, INNOVATIVE USE CASES, AND VALUE CREATION PROVIDING A ROADMAP FOR SUCCESSFUL SHARING IN OTHER BANDS.

Pursuant to the Spectrum Pipeline Act, the Commission is required to submit to Congress a report containing “an analysis of the results of the 2015 rule changes relating to the frequencies between 3550 megahertz and 3650 megahertz.”² While there remains important work for the Commission to complete, including the expeditious authorization of initial commercial deployments (“ICD”),³ and final certification of Spectrum Access System (“SAS”) Administrators and Environmental Sensing Capability (“ESC”) Operators to enable full

² Public Notice (citing Spectrum Pipeline Act of 2015, Pub. L. No. 114-74, § 1008, 129 Stat. 621,625 (2015), as amended by the Ray Baum’s Act of 2018, Pub. L. 115-141, § 614, 132 Stat. 1080, 1109 (2018)).

³ *Wireless Telecommunications Bureau and Office of Engineering and Technology Establish Procedure and Deadline for Filing Spectrum Access System Initial Commercial Deployment Proposals*, GN Docket No. 15-319, Public Notice, DA 18-783 (WTB/OET 2018).

commercialization of the CBRS band, Federated Wireless is proud to share with the Commission the expected benefits of those rule changes for consumers and the nation.

As noted by former FCC Commissioner Harold Furchtgott-Roth, “Spectrum is the fuel that energizes wireless services and wireless innovation” and “[m]ore spectrum available for commercial and personal wireless services means more wireless services and consumer value.”⁴

The Commission similarly recognized the significance of making 150 MHz of spectrum available for commercial use when it established the CBRS in 2015:

With this Report and Order . . . we adopt rules for commercial use of 150 megahertz in the 3550-3700 MHz band (3.5 GHz Band), and in so doing open a new chapter in the history of the administration of one of our nation’s most precious resources—the electromagnetic radio spectrum. Wireless broadband is transforming every facet of American life. We live in a world of wirelessly connected people, apps, and things. The 3.5 GHz Band has physical characteristics that make it particularly well-suited for mobile broadband employing small cell technology. The creation of our new Citizens Broadband Radio Service in this band will therefore add much-needed capacity to meet the ever-increasing demands of wireless innovation. As such, it represents a major contribution toward our collective goal of making 500 megahertz newly available for broadband use.⁵

In the three years since the Commission established the CBRS, these conclusions have been borne out, with CBRS emerging as a critical band for maintaining U.S. leadership in the race to 5G, and generating immense interest and demand across the country and various industry sectors. Commercial launch of CBRS is expected to create material positive impacts on the economy and for consumers, validating the effectiveness of new tools the Commission used to create the CBRS, including valuable spectrum sharing mechanisms.

⁴ Harold Furchtgott-Roth, *The Potential Market Value and Consumer Surplus Value of the Citizens Broadband Radio Service (CBRS) at 3550-3700 MHz in the United States*, 4 (Nov. 2017) (“Harold Furchtgott-Roth Analysis”).

⁵ *In the Matter of Amendment of the Commission’s Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, GN Docket No. 12-354, Report and Order and Second Further Notice of Proposed Rulemaking, FCC 15-47, para. 1 (April 21, 2015) (“3.5 GHz Order”).

A. The Commission’s Commitment to Sharing in the CBRS is an Essential Component of Winning the Global Race to 5G.

As the Commission noted in 2017, “The 3.5 GHz Band will play a significant role as one of the core mid-range bands for 5G network deployments throughout the world.”⁶ In 2017, Commissioner O’Rielly observed that, “The international focus on 5G spectrum has now shifted to the mid bands that carry more data than low bands, but propagate farther than millimeter wave. And the 3.5 GHz band is in the spotlight, right in the middle of the frequencies being considered.”⁷ Other international regions and nations, including the European Union, the United Kingdom, China, South Korea, and Japan are all “exploring bands that cover 3.5 GHz frequencies for possible 5G deployment.”⁸ Ofcom, the U.K. spectrum regulatory authority, has noted that spectrum in the 3 GHz range “has been identified as central to the rollout of 5G mobile across Europe.”⁹

Although CBRS will initially be deployed as 4G LTE, and will serve as a “a crucial band for creating capacity for 4G LTE networks,”¹⁰ CBRS is fully compatible with, and integral to, the introduction of 5G services in the United States. Significantly, Qualcomm has highlighted the importance of CBRS spectrum to 5G and the Commission’s critical role in “driving key spectrum initiatives to enable 5G,” including the establishment of CBRS.¹¹ Additionally, analysts

⁶ In the Matter of Promoting Investment in the 3550-3700 MHz Band; Petitions for Rulemaking Regarding the Citizens Broadband Radio Service 2017, GN Docket No. 17-258, FCC 17-134, para. 2 (Oct. 24, 2017) (“2017 CBRS NPRM”).

⁷ Remarks of Commissioner O’Rielly Before the CBRS Alliance (Aug. 1, 2017).

⁸ Comments of CTIA, GN Docket No. 17-258, at 2 (filed Dec. 28, 2017) (“CTIA Comments”).

⁹ See *Ofcom Sets Rules for Mobile Spectrum Auction*, OFCOM (released July 11, 2017), <https://www.ofcom.org.uk/about-ofcom/latest/media/media-releases/2017/ofcom-sets-rules-for-mobile-spectrum-auction>; CTIA Comments at 2.

¹⁰ CTIA Comments at 2.

¹¹ *What can we do with 5G NR Spectrum Sharing that isn’t possible today?*, QUALCOMM, (published Dec. 13, 2017), available at <https://www.qualcomm.com/media/documents/files/new-3gpp-effort-on-nr-in-unlicensed-spectrum-expands-5g-to-new-areas.pdf>.

expect that the 3.5 GHz band will be a breakthrough for 5G, noting the intense interest and investment from the important 5G players involved in CBRS, including all four major carriers, Nokia, Qualcomm, Intel, Comcast, and Charter, among others.¹²

In order to “maintain U.S. leadership in the global race for 5G,” the Commission took the commendable step of introducing an innovative sharing framework in the 3.5 GHz band.¹³

Without such an approach, the United States risked falling behind in 5G wireless technology and services. 5G simply will not wait for legacy approaches to spectrum management. Federated Wireless applauds the Commission’s approach to rapidly opening up critical 5G spectrum to new uses through its Part 96 sharing framework, saving valuable time and greatly accelerating time-to-market for these next generation services. The CBRS sharing framework has enabled the Commission and industry to deliver deployment-ready services in a key 5G band in less than half the amount of time required by legacy “clear and auction” approaches.¹⁴

B. CBRS Has Generated Immense Interest and Investment Across Industry Sectors and Emerged as a Critical Band to Meet Pent-Up Spectrum Demand.

Since the adoption of the CBRS Order, industry interest in, and momentum toward, dense, widespread commercial use of CBRS has grown at an exponential rate. The CBRS Alliance, founded less than two years ago,¹⁵ has seen its membership grow from the seven founders to more than 100 companies across the CBRS ecosystem, including wireless carriers,

¹² Sue Marek, *Why the 3.5 GHz CBRS Band Could Be a Breakthrough for 5G*, SDX CENTRAL (published Mar. 10, 2017), available at <https://www.sdxcentral.com/articles/news/3-5-ghz-cbrs-band-breakthrough-5g/2017/03/>.

¹³ See 2017 CBRS NPRM at para. 2.

¹⁴ See Thomas K. Sawanobori, CTIA, *From Proposal to Deployment: The History of Spectrum Allocation Timelines*, CTIA, 2 (published July 20, 2015) (“History of Spectrum Allocation”), available at <https://api.ctia.org/docs/default-source/default-document-library/072015-spectrum-timelines-white-paper.pdf>.

¹⁵ See *Industry Leaders Launch Alliance to Drive Deployment of LTE-based Solutions for the US 3.5 GHz Citizens Broadband Radio Service*, BUSINESS WIRE (published Aug. 23, 2016), available at <http://www.businesswire.com/news/home/20160823005517/en/Industry-Leaders-Launch-Alliance-Drive-Deployment-LTE-based>.

cable operators, wireless internet service providers, device and equipment manufacturers, tower companies, and prospective SAS administrators and ESC operators.¹⁶ Commissioner O’Rielly has applauded the diversity within the CBRS Alliance, stating that “What is most intriguing about the CBRS Alliance is the diversity of the membership. Your companies range from the largest Fortune 500 companies to smaller wireless providers, and everywhere in between.”¹⁷

Moreover, the Wireless Innovation Forum (“WinnForum”)—a consensus group comprised of stakeholders across the CBRS ecosystem—has developed standards and protocols that will enable the CBRS sharing framework, completing Release 1 of its specifications in January 2018.¹⁸ CBRS stakeholders have engaged in a wide variety of trials, including large-scale field trials, in preparation for the commencement of commercial operations in the near term.¹⁹ The existence and exponential growth of these cross-industry stakeholder organizations

¹⁶ See CBRS Alliance, “About Us,” available at <https://www.cbrcsalliance.org/about-us/>. Sponsor Members include: Access Technologies (Alphabet), Ericsson, Inc., Federated Wireless, Intel Corporation, Nokia, Qualcomm, and Ruckus Wireless; Full Members include: Airspan Networks, American Tower Corporation, Askey Computer Corp., Athonet, AT&T, Boingo Wireless, Cable Television Laboratories, Casa Sytems, Charter Communications, Cisco Systems, Comcast Corporation, CommScope, Cox Communications, Crown Castle, CTIA, Druid Software, ExteNet Systems, Frontier Communications, Fujitsu Network Communications, Huawei Technologies USA, ip.access Limited, KGPCo, Ligado Networks, Mavenir, Mobilitie, Motorola Solutions, Redline Communications, Samsung, SerComm USA, Sony Corporation, SpiderCloud Wireless, Sprint Corporation, T-Mobile USA, Technicolor, TelRad Networks, US Cellular, Verizon Communications, and Vivint; Adopter & Advisor Members include: 3rd Net, LLC, 7layers, Accelleran, Affirmed Networks, Antenna Company, Aricent, ATN International, Aquila, Baicells Technologies, Bandwidth, BLiNQ Networks, Cohere Technologies, Comba, Contela, DEKRA, GemTek Technology, GigaMonster, Infomark, JMA Wireless, Juni, Keysight Technologies, LandMark Wireless, Microlab, MobileStack, NetComm Wireless Limited, Nsight/Cellcom, PCTEL, PHAZR, QuadGen Wireless, Quanta Computer, QUCELL, Qulsar, Quortus, Radisys, SBA Communications, Sequans Communications, SGS, SOLiD, Sporton International, Syniverse Technologies, Taoglas Antenna Solutions, Transit Wireless, T&W Electronics, Vertical Bridge Holdings, Verveba Telecom, Virtual Network Communications, Wave Wireless, Westell, Wireless Information Networks, Windstream, ZenFi, Zinwave, and ZTE.

¹⁷ Remarks of Commissioner O’Rielly Before the CBRS Alliance (Aug. 1, 2017).

¹⁸ *CBRS Baseline Standards*, WINNFORUM, available at <https://www.cbrcs.wirelessinnovation.org/cbrcs-baseline-specifications>.

¹⁹ See, e.g., Monica Allevan, *A Year in, What’s Happening with Google, Verizon, Nokia and the 3.5 GHz CBRS Band?*, FIERCEWIRELESS (published Apr. 7, 2017), available at <http://www.fiercewireless.com/wireless/a-year-what-s-happening-google-verizon-nokia-and-3-5-ghz-cbrcs-band> (stating that it is “remarkable how far the 3.5 GHz sector has come in one year”); Monica Allevan, *Verizon Aims to Deploy Small Cells in 3.5 GHz When Practical*, FIERCEWIRELESS (published Mar. 10, 2017), available at <http://www.fiercewireless.com/tech/verizon-aims-to-deploy-small-cells-3-5-ghz-when-practical>; Monica Allevan, *AT&T Continues Quest to Test at 3.5 GHz*,

highlight the health and vibrancy of the CBRS ecosystem and the intense interest in bringing 150 MHz of highly valuable shared spectrum to market as expeditiously as possible, a feat achieved by the Commission through spectrum sharing in the CBRS band.

Indeed, as previously explained to the Commission, Federated Wireless alone has conducted more than 50 technical trials and has a number of important field trials underway with a variety of CBRS stakeholders, including Charter, Verizon, American Tower, and ARRIS / Ruckus Wireless.

Federated Wireless and its partners have also tested CBRS equipment compatibility with twenty different OEM vendors, and through its trials, Federated Wireless has had Citizens Broadband Service Devices (“CBSDs”) on the air and connected to its SAS, which has processed thousands of spectrum grant requests per week.²⁰

Excitement is building around the efficiencies that spectrum sharing technologies are bringing to spectrum management, and with good reason. ICD in the CBRS band is imminent,²¹ representing the bridge from limited lab testing to full commercialization of the band. Federated Wireless has submitted its plans for ICD to the Commission²² and is eagerly anticipating the opportunity to deploy its SAS in conjunction with its industry partners to fully realize the potential of the CBRS spectrum and confirm the efficiency and effectiveness of spectrum sharing in the CBRS frequencies and beyond. Indeed, Federated Wireless was proud to announce in its

FIERCEWIRELESS (published Mar. 7, 2017), available at <http://www.fiercewireless.com/tech/at-t-continues-quest-to-test-at-3-5-ghz>.

²⁰ See Letter from Ross Vincenti, Chief Legal Officer, Federated Wireless, Inc. to Marlene H. Dortch, Secretary, FCC, GN Docket Nos. 17-258, 15-319 (filed Dec. 5, 2017).

²¹ *Wireless Telecommunications Bureau and Office of Engineering and Technology Establish Procedure and Deadline for Filing Spectrum Access System Initial Commercial Deployment Proposals*, GN Docket No. 15-319, Public Notice, DA 18-783 (WTB/OET July 27, 2018).

²² Federated Wireless, Inc., Proposal for Initial Commercial Deployment in the Citizens Broadband Radio Service, GN Docket No. 15-319 (filed Sep. 10, 2018).

ICD proposal that there is so much pent up demand for CBRS spectrum that it is partnering with 15 companies, including top-tier wireless carriers, cable service providers, a major tower company, and a managed service provider to deploy MNO, MSO, private LTE and fixed wireless CBRS solutions at 15,773 sites across 47 states and the District of Columbia.²³ The Commission can be very proud of the spectrum sharing opportunity it created in the CBRS band.

C. Economic Analysis Has Demonstrated that CBRS Will Generate Tremendous Benefits for the U.S. Economy and Consumers.

Auction returns are neither the only, nor the best, indicator of the success of spectrum policy. Indeed, policies that continually provide maximum value to consumers through new and innovative services, such as those enabling spectrum sharing, are crucial to the United States maintaining its global leadership in the commercial wireless industry and are thus equally important as generating auction revenues for the U.S. Treasury. One need only look to unlicensed spectrum to recognize the insufficiency of evaluating the success of a particular spectrum policy solely by reference to its potential to generate auction revenues. Unlicensed spectrum has no “market value” because it cannot be bought or sold. However, there is enormous value provided to consumers and businesses that rely on unlicensed applications. Similarly, as the use of dynamic sharing expands to spectrum bands beyond CBRS, sharing frameworks will continue to unlock additional value that will be measured in the hands, homes, and offices of American consumers and businesses, rather than on the auction block.

The Commission’s establishment of the innovative sharing framework in the CBRS band will bear significant economic fruit. It is estimated that each additional 10 MHz of wireless

²³ While the number of sites identified in the Federated Wireless ICD proposal is significant, it represents a limited initial deployment, as in the aggregate Federated Wireless’s customers plan to deploy CBRS across millions of sites following final certification of SAS Administrators and full commercialization of the band.

spectrum for commercial use generates a \$3.6 billion increase in GDP.²⁴ With the innovative and flexible sharing approach established for the CBRS, the Commission has rapidly made available 150 MHz of spectrum for commercial use, a 16% increase of total available licensed spectrum,²⁵ representing unlocked value ranging from \$80 billion to \$260 billion.²⁶

In addition to monetary benefits, the Commission's actions in the CBRS band are enabling a variety of innovative use cases, including: "(1) mobile operator capacity augmentation; (2) cable and MVNO system augmentation; (3) neutral host network for public space; (4) wireless internet service providers (WISPs) particularly in rural areas; and (5) enterprise LTE."²⁷ Moreover, initial cost analyses demonstrate that CBRS will support cost-effective indoor wireless deployments²⁸ as well as fixed wireless deployments with lower total cost of ownership and increased profitability.²⁹ As Harold Furchtgott-Roth noted in his analysis of the expected economic benefits of CBRS commercialization, "The widespread industry interest in the band suggests substantial value."³⁰ In the absence of the Commission's implementation of the CBRS sharing framework, it would have taken many more years to unlock the previously untapped value of the 3.5 GHz spectrum resource.

²⁴ *The Impact of 10 MHz of Wireless Licensed Spectrum*, RECON ANALYTICS (2016), available at <https://api.ctia.org/docs/default-source/default-document-library/for-every-10-mhz.pdf>.

²⁵ Harold Furchtgott-Roth Analysis at 5.

²⁶ It is estimated that the net present value of the consumer surplus, a measure of the additional value that consumers receive over what they pay, for the entire CBRS band "ranges from \$80 billion to \$260 billion." Harold Furchtgott-Roth Analysis at 19.

²⁷ Harold Furchtgott-Roth Analysis at 15-16.

²⁸ K. Mun, *Enterprise Mobile Infrastructure 2018*, MOBILE EXPERTS, 20 (May 2018) ("CBRS small cells, with inherent multi-operator support and simplicity of Wi-Fi like installation, can provide a cost-effective mobile coverage solution for third-party neutral host providers and enterprises alike.").

²⁹ Monica Paolini and Senza Fili, *The Total Cost of Ownership (TCO) for Fixed Ongo in the 3.5 Ghz CBRS Band*, SENZA FILI CONSULTING, 7-12 (2018).

³⁰ Harold Furchtgott-Roth Analysis at 16.

D. CBRS Has Proven the Effectiveness of the Commission’s Innovative Approaches to Spectrum Management and Commercialization.

As discussed above, with commercialization imminent, the CBRS is a massive success story on the verge of happening, and will soon deliver on the promise first identified by the White House in 2012. In 2012, the President’s Council of Advisors on Science and Technology (“PCAST”) released a report in which it concluded that, given the exploding demand for commercial wireless spectrum and the continuing spectrum needs of Federal users, the traditional practice of clearing portions of Federally held spectrum for exclusive commercial use was not a sustainable model for future spectrum policy.³¹ Instead, PCAST concluded that the best way to increase the availability of spectrum for commercial broadband would be to leverage new technologies, such as dynamic frequency coordinators, spectrum databases, and improved interference mitigation tools, to allow spectrum to be shared among Federal and commercial users.³² In reaching this conclusion, PCAST found that sharing should be the preferred model for spectrum management and that implementation of sharing regimes could increase the effective capacity of Federal spectrum by a factor of 1,000.³³

In 2015, the Commission implemented the vision articulated in the PCAST report and adopted a spectrum sharing regime and a tiered access system for the 150 MHz of spectrum in the CBRS frequencies. The CBRS framework accommodates multiple different types of uses in the band, leverages dynamic spectrum sharing technologies to prevent interference to incumbent

³¹ PCAST, Report to the President: Realizing the Full Potential of Government-Held Spectrum to Spur Economic Growth, at vi (rel. July 20, 2012) (“PCAST Report”), available at http://www.whitehouse.gov/sites/default/files/microsites/ostp/pcast_spectrum_report_final_july_20_2012.pdf

³² *Id.*

³³ *Id.*

and priority users, provides needed spectrum access to new entrants, and, all the while, exponentially increases the efficiency of spectrum utilization for all potential users.

To accomplish these ends, the Commission has taken a pioneering approach and adopted two innovative tools for the management of CBRS spectrum: (1) utilization of dynamic sharing technologies; and (2) reliance on cross-industry stakeholder bodies to develop standards and technologies on a timeline far faster than possible under legacy spectrum management approaches.

First, the reliance of the CBRS sharing framework on dynamic sharing technologies solves a number of complex issues that face many, if not all, spectrum bands today. The SAS-based sharing framework in the CBRS enables flexible, shared use among incumbents and emerging new use cases by exploiting the fact that the SAS is highly scalable and able to rapidly adapt to new uses. The SAS can dynamically adjust spectrum allocations, power limits, and other operational parameters to ensure protection to incumbents and afford spectrum access for new entrants. The flexible sharing approach adopted in the CBRS, which imposes a minimal set of common technical standards, and employs a SAS to manage disparate uses and technologies, also provides regulatory and technological flexibility that allows use cases to develop over time. Relying on the SAS to administer flexible spectrum use in the context of these baseline technical standards obviates the need for the Commission to predict use cases for a particular band, and minimizes the time, cost, and impact of implementing modified regulations as technology and business cases emerge, effectively future-proofing the regulation of shared spectrum bands. Similarly, the CBRS sharing framework also solves the problem of how to provide for shared, opportunistic access to spectrum while dynamically implementing protections for incumbent or priority users as their operations change, both from moment to moment and as future systems

evolve. For example, the SAS in the CBRS band dynamically protects shipborne radar operations as they near the coastline by seamlessly and securely reallocating non-Federal users to different frequencies. Similarly, the SAS will respond to changes in priority commercial licensees' operations by altering the licensee's protected contour and the areas in which opportunistic access is available.

Second, the collaborative approach between industry and government to develop the CBRS framework has greatly reduced time-to-market. In establishing the CBRS, the Commission correctly observed that "a multi-stakeholder group focused on the complex technical issues raised by this proceeding could provide us with a wealth of valuable insights and useful information."³⁴ As the WinnForum has explained,

[t]he Wireless Innovation Forum's Spectrum Sharing Committee ("SSC") was specifically formed to develop the solutions and standards that will encourage rapid development of the CBRS ecosystem, protect incumbent operations, and benefit all potential stakeholders in the band . . . the SSC benefits from participation of a broad based group that includes wireless carriers, network equipment manufacturers, potential SAS Administrators, satellite operators, existing 3650-3700 MHz band licensees, and other parties with an interest in the 3550 MHz band.³⁵

Leveraging the WinnForum and the CBRS Alliance as partners, the Commission has jump-started CBRS deployment by a significant margin. Through this partnership, the WinnForum has developed a number of standards and protocols to effectuate Part 96 regulations, including inter-SAS communication, SAS-base station communication, information security, and information sharing and data privacy. These standards and protocols have developed at the pace of industry innovation, rather than the timelines typical of legacy, command-and-control regulatory

³⁴ 3.5 GHz Order at para. 416.

³⁵ Reply Comments of WinnForum, GN Docket No. 12-354 (filed Aug. 14, 2015).

approaches. This new approach to spectrum development can be readily transported, subject to band-specific modifications, to other spectrum bands.

The effect of both of these innovative steps has been to dramatically increase speed to market, with full commercialization of the CBRS frequencies imminent just 6 years after the opportunity was first conceived in the PCAST report. This is in stark contrast to the protracted timelines that characterize legacy approaches to the allocation of spectrum, taking an average of 13 years.³⁶ This dramatic improvement in speed-to-market is especially crucial as the United States works to maintain its global leadership position in the development and introduction of 5G services. The framework developed for CBRS is a testament to how sharing technologies, and collaboration between the Commission and industry, can be used to support varied uses within a single band, balancing the needs of government users, incumbents, new licensed users, and unlicensed users – this model can and should be easily replicated in other bands.

II. THE COMMISSION SHOULD PROVIDE FOR SHARING IN THE 3.7-4.2 GHZ, 3.45-3.55 GHZ, 5.925-7.125 GHZ, 26 GHZ, 37 GHZ, 70/80 GHZ AND 4.9 GHZ BANDS.

The work undertaken by the Commission and industry to create success in the CBRS band should serve as a roadmap for the use of spectrum sharing regimes in additional bands, enabling commercial access to previously unavailable spectrum resources. In the view of Federated Wireless, such regimes are particularly well-suited for the 3.7-4.2 GHz, 3.45-3.55 GHz, 3.1-3.45 GHz, 5.925 GHz-7.125 GHz, 37 GHz, 26 GHz, 70/80 GHz and 4.9 GHz bands. In view of the scarcity of our national spectrum resource and the need for additional wireless bandwidth to serve the ever-expanding demand for broadband connectivity, Federated Wireless

³⁶ See History of Spectrum Allocation.

urges the Commission and Congress to fully embrace sharing as a comprehensive approach to improve spectrum management policy.

As demonstrated above, sharing, among many other benefits: (1) provides the capability to authorize spatial reuse and sharing of spectrum among incumbents and new users, significantly increasing utilization while reliably ensuring protection of incumbent and priority uses; and (2) enables operational and regulatory flexibility that solves policy and technical challenges for the Commission and industry that naturally occur when redeploying spectrum with incumbent users. Spectrum sharing future-proofs the Commission’s regulation of the bands and allows business cases to develop over time. Federated Wireless thus urges the Commission to explore the following bands for sharing:

3.7-4.2 GHz

- The 3.7-4.2 GHz band is used today primarily by the non-Federal Fixed Satellite Service (“FSS”) for the delivery of audio and video programming, with additional fixed service (“FS”) use for point-to-point private and common carrier microwave links, but it is not intensively used. Spectrum sharing would promote flexible use of the 3.7-4.2 GHz band by allowing new operations, while protecting incumbent operations avoiding costly, and lengthy, delays in redeployment which would occur through either Commission-led or market-based relocation mechanisms. In addition, utilizing a dynamic, database-enabled sharing regime in which operational parameters – i.e., azimuth, elevation angle, beamwidth, etc. – of FSS earth stations are incorporated into the database would facilitate co-frequency sharing between incumbent FSS operations and newly authorized terrestrial uses at distances much closer than currently contemplated.

3.45-3.55 GHz

- The 3.45-3.55 GHz band is used today primarily by military radar systems. However, the 3.45-3.55 GHz band has been identified by both the National Telecommunications and Information Administration (“NTIA”) and the Department of Defense for possible introduction of advanced wireless services in the band.³⁷ The 3.45-3.55 GHz band, adjacent to the CBRS band, presents an opportunity to multiply the benefits of sharing by providing for larger amounts of contiguous spectrum. This would allow devices to

³⁷ David J. Redl, Assistant Secretary for Communications and Information and NTIA Administrator, *NTIA Identifies 3450-3550 MHz for Study as Potential Band for Wireless Broadband Use*, NTIA BLOG (Feb. 26, 2018), available at <https://www.ntia.doc.gov/blog/2018/ntia-identifies-3450-3550-mhz-study-potential-band-wireless-broadband-use>.

operate with wider channel bandwidths and higher data rate. Sharing would provide the protection required by Federal incumbents and avoid disruption of those operations, while enabling rapid deployment of new commercial activity in the band. Indeed, Commissioner O’Rielly has highlighted the importance of opening this band to commercial use given its proximity to the CBRS spectrum, stating that the Commission should evaluate sharing mechanisms as a means to provide commercial access.³⁸

3.1-3.45 GHz

- 3.1-3.45 GHz spectrum is used today for Federal ground-based, airborne, and shipborne radar systems. Based on a quantitative assessment of spectrum usage, NTIA identified potential non-Federal sharing opportunities in 3.1-3.45 GHz band in 2016.³⁹ Commissioner O’Rielly also has encouraged the Commission to evaluate the feasibility of making this spectrum available for additional wireless uses.⁴⁰ In light of the varied and intensive Federal use of this spectrum, this band could most effectively and expeditiously be made available for commercial use through a sharing regime that both protects Federal incumbents and enables new licensed and unlicensed wireless uses of the spectrum.

5.925-7.125 GHz

- 5.925-6.425 GHz spectrum is used today by non-Federal FSS operators for earth station uplink and command signals, in conjunction with downlink operations in the 3.7-4.2 GHz band, and FS point-to-point microwave links supporting a variety of services such as public safety (including backhaul for police and fire vehicle dispatch), coordination of railroad train movements, control of natural gas and oil pipelines, regulation of electric grids, and backhaul for commercial wireless traffic. The 6.425-7.125 GHz band is currently primarily used by FS point-to-point microwave links and fixed Broadcast Auxiliary Service operations supporting services such as public safety (including police and fire vehicle dispatch), coordination of railroad train movements, control of natural gas and oil pipelines, regulation of electric grids, backhaul for wireless traffic, television studio-transmitter links, television relay, and television translator relay stations. Federated Wireless supports the coordinated, unlicensed framework proposed by the Radio Local Area Network (RLAN) group,⁴¹ which will establish robust protection of incumbents with flexible rules to support investment and innovation. However, Federated Wireless notes that automated frequency coordination tools, such as those used in CBRS, are

³⁸ See, e.g., Remarks of Commissioner Michael O’Rielly Before 5G Americas’ “Technology Briefing” (Oct. 5, 2017).

³⁹ Penny Pritzker and Lawrence E. Strickling, *Quantitative Assessments of Spectrum Usage*, NTIA, 65 (Nov. 2016), available at https://www.ntia.doc.gov/files/ntia/publications/ntia_quant_assessment_report-no_appendices.pdf

⁴⁰ Remarks of Commissioner Michael O’Rielly Before 5G Americas’ “Technology Briefing” (Oct. 5, 2017); see also Remarks of Commissioner Michael O’Rielly Before the Policy Forum at AT&T “The 3.5 GHz Future Innovation Showcase” (Feb. 13, 2018).

⁴¹ Letter from Paul Margie, Counsel to Apple Inc., Broadcom Inc., Facebook, Inc., Hewlett Packard Enterprise, and Microsoft Corporation to Marlene Dortch, GN Docket No. 17-183, dated August 2, 2018, available at [https://ecfsapi.fcc.gov/file/1080236093470/Ex%20Parte%20\(Aug.%2020202018\)%20\(FINAL\).pdf](https://ecfsapi.fcc.gov/file/1080236093470/Ex%20Parte%20(Aug.%2020202018)%20(FINAL).pdf)

necessary to protect incumbent operations, enable the densest possible spectrum use by new entrants, and ensure that the deployment of innovative new uses is not stalled as users wait for cumbersome manual coordination processes to complete, particularly as use of the band becomes more intensive and interference calculations become more complex.

37 GHz

- Federated Wireless commends the Commission on its innovative approach to licensing the 37-37.6 GHz band, in which Federal and non-Federal users will share the band on a co-primary basis. This non-exclusive “bidirectional sharing” regime will best ensure spectrum availability for Federal and non-Federal users while also enabling innovative uses of the band, and provides a roadmap to enabling commercial use of valuable spectrum resources while preserving Federal access to support critical military, public safety, and other operations.

26 GHz

- The 25.25-27.5 GHz spectrum is allocated primarily for Federal use, though such use today is limited, and the Commission is thus considering whether to enable bidirectional sharing in the band between Federal and non-Federal users in much the same way as proposed in the 37-37.6 GHz band. The 26 GHz band is also the subject of a growing international consensus that “terrestrial mobile services should be authorized in the broader 24.75-27.5 GHz band.”⁴² The band is also under consideration for use by high-altitude platform system and “persistent stratospheric-based communications infrastructure” operating at altitude to provide broadband services, with some analyses concluding that sharing between such applications and terrestrial mobile operations would require “dynamic coordination and information sharing.”⁴³ The 26 GHz band thus presents an opportunity to leverage the dynamic sharing capabilities already available through the SAS developed for the CBRS to facilitate both bidirectional sharing between Federal and non-Federal users and sharing between and among disparate non-Federal uses. Utilizing these capabilities would preserve access to the band for future Federal deployments and enable 5G services and other innovative uses to co-exist side-by-side.

70/80 GHz

- This spectrum is used today by on a Federal/non-Federal co-primary basis primarily for fixed point-to-point links supporting backhaul and other services. Additionally, there are a number of other allocations in these bands, including co-primary allocations for Federal and non-Federal fixed, FSS, Mobile, and Mobile Satellite Service, as well as unlicensed vehicular radars at 76-77 GHz. Use of a Part 96 framework administered by a SAS in the 70 and 80 GHz band would allow Federal users to add new sites and otherwise expand

⁴² *Use of Spectrum Bands Above 24 GHz For Mobile Radio Services et al.*, GN Docket No. 14-177 *et al.*, Third Report and Order, Memorandum Opinion and Order, and Third Further Notice of Proposed Rulemaking, FCC 18-73, at para. 75 (2018).

⁴³ *Id.* at para. 85.

their operations when the need arises. If and when a Federal user needs to expand its operations at a site or to add a new site, the SAS could quickly incorporate the expanded operations or new site and protected contour into its calculations and alter the authorized operating parameters for other 70 and 80 GHz users, thereby ensuring that critical Federal operations are able to access the spectrum needed in the future.

4.9 GHz

- As is the case in the CBRS, the 4.9 GHz band currently supports operations by disparate users, including radio astronomy, naval training operations, public safety and critical infrastructure operations. However, the 4.9 GHz band is also underutilized in significant portions of the country and, as such, is a prime candidate for sharing spectrum among and between incumbent and newly authorized commercial or private operations.

III. CONCLUSION

The Commission took a commendable step in creating CBRS, an action that will bear significant fruit for consumers in the very near term. The Commission should apply the sharing roadmap proven out by CBRS to the 3.7-4.2 GHz, 3.1-3.45 GHz, 3.45-3.55 GHz, 5.925-7.125 GHz, 26 GHz, 37 GHz, 70/80 GHz and 4.9 GHz bands to exponentially increase the capacity of these resources, future-proof regulations, protect incumbent operations, reduce interference and monitor and enforce compliance with the Commission's rules.

Respectfully submitted,

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