

**Before the
DEPARTMENT OF COMMERCE
National Telecommunications and Information Administration**

Development of a National Spectrum Strategy
Docket No. 230308-0068

COMMENTS OF WISPA – *BROADBAND WITHOUT BOUNDARIES*

WISPA – *Broadband Without Boundaries* is pleased to respond to the Request for Comments (“*RFC*”) to provide its recommendations to the National Telecommunications and Information Administration (“NTIA”) on how it can develop and implement a National Spectrum Strategy (“Strategy”).¹

As NTIA considers the record in this proceeding, WISPA asks NTIA to prioritize the need to repurpose and share spectrum to help bridge the digital divide that separates rural and disadvantaged communities from the benefits of affordable broadband access. As NTIA observes, “[a]ccess to more spectrum, in short, will help the United States continue to lead the world in advanced technology and enhance our national and economic security.”² But it is also true that “the Strategy [should] promote diverse spectrum access opportunities including widespread, intensive, and low-cost access to spectrum-based services for consumers.”³

This is precisely what WISPA’s members have done for the last two decades. Comprised largely of small businesses, they have spent their own capital (and, more recently in some cases, subsidies from the Federal Communications Commission’s (“FCC”) high-cost programs) to drive technology innovation and implement broadband solutions using a variety of licensed, unlicensed and shared spectrum, serving millions of households that would not otherwise have

¹ See 88 Fed. Reg. 16244 (March 16, 2023).

² *RFC* at 16245.

³ *Id.* at 16246.

access to affordable broadband high-speed Internet. Critical to this success has been the availability of a variety of spectrum bands and tools so that broadband providers can select the best approach for a particular situation. This is integral to providing reliable and effective service in even the most remote and challenging areas. To best serve American consumers, wherever they live, broadband providers must be able to choose the “right tool for the right job.” Among those vital tools has been the availability of fallow federal spectrum, whether through band clearing or, more commonly, sharing techniques that enable federal and non-federal users to share spectrum.

Spectrum has been shared geographically for many years, but recent innovations have enabled spectrum also to be shared on a frequency, time and power basis through the Citizens Broadband Radio Service (“CBRS”) Spectrum Access System (“SAS”) and Environmental Sensing Capability (“ESC”) and the Automated Frequency Coordination (“AFC”) systems authorizing outdoor standard power use in the 6 GHz band.

WISPA appreciates the public process NTIA has initiated, and commits to long-term engagement as the Strategy is developed, implemented and modified over time. In these Comments, WISPA urges NTIA to adopt the following policy priorities:

- An audit of actual use of spectrum by federal and non-federal users.
- A balanced spectrum policy that enables access to spectrum by large and small providers to licensed, shared and unlicensed spectrum, with auctioned spectrum available in small geographic areas.
- Spectrum sharing via electronic spectrum coordination methods such as SAS and AFC models for sharing among federal and non-federal users (e.g., CBRS) and sharing among different kinds of non-federal users (e.g., 6 GHz).
- Other bands, such as the 3.1-3.45 GHz and 10 GHz bands, should be studied in the short-term for shared use.
- Auction spectrum in smaller spectrum blocks and smaller geographic areas.
- Strengthened buildout requirements to prevent warehousing.

About WISPA

WISPA is a trade organization that represents the interests of hundreds of small fixed wireless internet service providers (“WISPs”) that deliver broadband internet connectivity services to approximately seven million consumers, businesses and industrial users, first responders and community institutions, often in areas of the country where other providers have declined to invest. Most WISPs provide fixed broadband access as a standalone service, though many also offer interconnected VoIP services where there is consumer demand or where required by the FCC under its universal service program rules. To provide their services, WISPs frequently use unlicensed, shared and exclusive-use licensed spectrum at low-band, mid-band and high-band frequencies, predominantly in rural, unserved, and underserved areas. In many rural and remote areas, WISPs provide the only terrestrial source of fixed broadband access. In areas with other broadband options, WISPs provide a community-based alternative that benefits customers by fostering competition, thereby lowering costs and improving the quality of broadband services.⁴

For more than twenty years, smaller providers such as WISPA’s members have deployed affordable and reliable broadband service with innovative and evolving fixed wireless technology, a combination of spectrum bands, and their own capital to meet the needs of consumers, businesses, health care facilities, governmental entities, and first responders in rural areas that have not historically been cost-efficient for larger companies to deploy wireline plant. By providing broadband services with their own capital, they also have created thousands of jobs in rural and exurban areas that, in turn, attract additional businesses and investment. They have

⁴ See *Liftoff! Internet Service Providers Take Flight with Fixed-Wireless and Hybrid Networks: The 2021 Fixed-Wireless and Hybrid ISP Industry Report*, The Carmel Group (2021) (“Carmel Report”) at 6, Fig. 1 (depicting typical fixed wireless network architecture), available at [2021_WISPA_Report_FINAL.pdf](#).

continually upgraded their networks with new technology and new spectrum allocations to meet consumer demand, and have successfully responded to the dramatic rise in bandwidth consumption during the ongoing coronavirus pandemic.⁵ In some areas, they have integrated fiber into their networks, either as middle-mile or last-mile connections, and are well situated geographically to expand into nearby areas with cost-effective and expeditious deployment of state-of-the-art equipment.

The successes and future prospects for the WISP industry are analyzed in The Carmel Report. Among other things, the Carmel Report notes the following:

- Robust growth that is projected to increase subscribership from 6.9 million at the end of 2020 to 12.7 million by the end of 2025, with corresponding increases in industry revenues.⁶
- Favorable economics that “enable rapid, reliable, flexible network deployments at a fraction of the cost of other technology platforms.”⁷ Fixed wireless technology can be deployed at a per-subscriber capital cost that is one-ninth the cost of fiber and one-fifth the cost of cable.⁸ Return on investment can be achieved in less than a year.⁹
- “New and maturing standards-based technologies in network and antenna hardware, customer premises equipment (CPE), and wireless telecoms software and services are contributing to greater efficiencies and choices for ISPs.”¹⁰
- “Unprecedented funding flows from private and public sources are driving more investment.”¹¹

⁵ See *id.* at 8, Fig. 2 (listing many of the spectrum bands WISPs use); see also *id.* at 21 (noting WISPA survey results reporting that more than 80% of WISPs upgraded their networks during the pandemic to meet increased consumer demand).

⁶ See *id.* at 4 and 16, Fig. 5.

⁷ *Id.* at 4.

⁸ See *id.* at 19, Fig. 8 (comparing economics of broadband access technologies).

⁹ See *id.* at 19.

¹⁰ *Id.* at 5; see also *id.* at 23-24.

¹¹ *Id.* at 5; see News Release, *Element8 Secures \$200 Million for National Expansion from Digital Alpha* (March 15, 2023), available at [ELEMENT8 SECURES \\$200 MILLION FOR NATIONAL EXPANSION FROM DIGITAL ALPHA \(e8internet.com\)](#); News Release, *Rise Broadband Announces Acquisition by GI Partners* (Feb. 2, 2023), available at [Rise Broadband Announces Acquisition by GI Partners | News | GI Partners](#); BusinessWire, *Honest Networks Raises Significant Funding Led by Newlight Partners to*

The Carmel Report concludes that:

The combination of the five growth drivers – favorable economics, significant consumer and industry demand, helpful governmental policies, technology developments, and funding trends – along with persistent broadband gaps and the lack of ISP choices in many rural and urban areas – point to a clear conclusion. The business and policy case for greater support of fixed-wireless and hybrid networks is compelling. *Not only does fixed wireless serve U.S. policy goals of rapidly connecting Americans; it also makes good business sense in many communities that are unserved, under-served, or poorly served.*¹²

NTIA should keep these drivers and advantages in mind as it crafts its Strategy so that the myriad attributes of reliable fixed wireless and hybrid networks can be realized for the benefit of consumers that lack access to affordable and adequate broadband service.

WISPA's Spectrum Policy Advocacy

Since its founding in 2004, WISPA has advocated for balanced spectrum policies that leverage the benefits of each spectrum environment and spectrum sharing techniques. As an overall objective, WISPA favors a mix of licensed, shared, and unlicensed spectrum.

For example, WISPA was a key contributor to the proceeding that resulted in the CBRS service.¹³ With years of active deployments in the then-existing 3650-3700 MHz band, WISPs

Accelerate Expansion of Gigabit Internet Service (Aug. 12, 2021), available at [Honest Networks Raises Significant Funding Led by Newlight Partners to Accelerate Expansion of Gigabit Internet Service | Business Wire](#); News Release, Searchlight Capital Partners, *Searchlight Capital Partners Makes Strategic Investment in All Points Broadband* (July 6, 2021), available at [Searchlight Capital Partners Makes Strategic Investment in All Points Broadband](#); Inside Towers, *Bain Capital Completes Acquisition of Surf Broadband* (June 30, 2021), available at [30 June 2021.pdf \(insidetowers.com\)](#); PR Newswire, *Point Broadband Announces Strategic Investment from GTCR* (Apr. 16, 2021), available at [Point Broadband Announces Strategic Investment from GTCR \(prnewswire.com\)](#); PR Newswire, *American Broadband Holding Company to be Acquired by Madison Dearborn Partners and Catania* (Dec. 21, 2020), available at [American Broadband Holding Company to be Acquired by Madison Dearborn Partners and Catania \(prnewswire.com\)](#).

¹² Carmel Report at 5 (emphasis added).

¹³ Comments of Wireless Internet Service Providers Association, GN Docket No. 12-354 (filed Feb. 20, 2013).

saw the advantages of being able to access the adjacent 100 megahertz between 3550-3650 MHz using new spectrum sharing techniques that protect federal users and earth stations from harmful interference and establish two additional tiers of access by non-federal users. Although the sharing model is not without problems occasioned by the conservative rules that overprotect incumbents,¹⁴ many WISPA members have deployed high-speed fixed broadband service to tens of thousands of consumers and businesses.

As another example, WISPA strongly supported the FCC's efforts to make available 850 megahertz of unlicensed spectrum in the 6 GHz band for outdoor use on a point-to-multipoint or point-to-point basis.¹⁵ To protect incumbent licensees using spectrum in that band for point-to-point use, WISPA advocated for the development of the AFC system, and it has taken a leadership role in the multi-stakeholder group that is finalizing the AFC system standards and protocols.

WISPA also has initiated two rulemaking proceedings at the FCC intended to unlock more spectrum that can be shared with federal and non-federal users. In 2017, WISPA and others filed a petition for rulemaking for the 3.7-4.2 GHz band and proposed specific rules for authorizing use of the band under a coordinated regime governed by Part 101 of the FCC's rules that would protect incumbent earth stations through geographic exclusion zones.¹⁶ Adjacent to the CBRS band, this additional spectrum would have been very attractive to WISPs, especially those that were using that spectrum. Unfortunately, the FCC decided to undertake a multi-year

¹⁴ *See infra* at 11.

¹⁵ Comments of Wireless Internet Service Providers Association, ET Docket No. 18-295, GN Docket No. 17-183 (filed June 29, 2020).

¹⁶ Broadband Access Coalition, Petition for Rulemaking to Amend and Modernize Parts 25 and 101 of the Commission's Rules to Authorize and Facilitate the Deployment of Licensed Point-to-Multipoint Fixed Wireless Broadband Service in the 3700-4200 MHz Band, RM-11791 (filed June 21, 2017).

spectrum clearing exercise and auction the band for exclusive use. And, also unfortunately, the FCC adopted a competitive bidding framework that auctioned spectrum in 20-megahertz blocks in large Partial Economic Areas (“PEAs”).¹⁷ As a result of these unwise policy decisions, the larger auction lots did not conform to the smaller, regional areas where WISPA members desired spectrum – in order to acquire licenses, metaphorically they would be forced to buy a shopping mall when they only need a kiosk. Such parameters also made it fiscally impossible for smaller entities to participate.

More recently, on October 4, 2022, WISPA led a coalition in asking the FCC to make the 10-10.5 GHz band available for point-to-point use on a nationwide non-exclusive basis, with interference protection governed by an AFC system.¹⁸ The Coalition Petition points out that over the last decade, the FCC has made thousands of megahertz of spectrum available for last-mile use, but that there is a shortfall of point-to-point spectrum available for backhaul to support last-mile use, especially in rural areas where fiber is either unavailable or overly expensive, or where the logistics of fiber deployment are very difficult.

WISPA will continue to advocate for spectrum policies that appropriately balance licensed, shared and unlicensed allocations for fixed and mobile services; auction frameworks that make spectrum available in smaller geographic areas; and greater availability of spectrum for both point-to-multipoint and point-to-point use. To help meet these objectives, WISPA welcomes NTIA’s questions and the open-ended approach the *RFC* takes in inviting public

¹⁷ Public Notice, *Auction of Flexible-Use Service Licenses in the 3.7-3.98 GHz Band for Next-Generation Wireless Services; Notice and Filing Requirements, Minimum Opening Bids, Upfront Payments, and Other Procedures for Auction 107*; *et al*, AU Docket No. 20-25, 35 FCC Rcd 8404 (2020).

¹⁸ *See* Petition for Rulemaking of the Coordinated Sharing Coalition (filed Oct. 4, 2022) (“Coalition Petition”). Despite the fact that this Petition was submitted to the Commission more than six months ago, to date it has neither been placed on Public Notice to solicit comment nor assigned a rulemaking number.

participation. WISPA looks forward to further and ongoing engagement with NTIA, the FCC and other stakeholders in crafting a national spectrum strategy.

Discussion

Pillar #1 – A Spectrum Pipeline to Ensure U.S. Leadership in Spectrum-Based Technologies

A. The National Spectrum Strategy Should Promote a Balanced Spectrum Policy

i. Short-Term Objectives Should Focus on Concluding Pending FCC Spectrum Proceedings and Commencing a Spectrum Audit

In Question 1, NTIA asks about short-term, medium-term, and long-term spectrum requirements.¹⁹ With respect to short-term requirements, WISPA makes the following recommendations.

First, the FCC should conclude the 6 GHz proceeding, including testing and certification, as soon as possible to enable the availability of 850 megahertz for outdoor standard power unlicensed use in large portions of the country, especially in rural areas where there is less incumbency. Perhaps more than any other spectrum band, this large amount of spectrum will help broadband providers bridge the digital divide in rural America with reliable broadband service. Through the use of an AFC system, existing and future point-to-point licensees can be protected from harmful interference, with now fallow spectrum available for commercial use. Because much of the available spectrum is in rural areas where WISPs have heavily deployed on the adjacent 5 GHz band, WISPA anticipates that, when available, the 6 GHz band will attract heavy usage to meet increasing consumer demand. As evidence, NTIA should note that the FCC has approved dozens of applications for experimental licenses in the 6 GHz band, with multiple entities trialing equipment from a number of vendors that are already competing for market

¹⁹ *RFC* at 16245.

share. These trials have demonstrated that Gigabit download speeds in the 6 GHz band are possible.²⁰

Second, the FCC should initiate a rulemaking proceeding to make the 10-10.5 GHz band available for coordinated, point-to-point use on a shared basis with federal and amateur users.²¹ As described in the Coalition Petition, additional backhaul spectrum is needed to support the ongoing and anticipated increase in last-mile use stemming from the permanent effects of the pandemic – more intensive use of broadband in residential areas for video streaming, telehealth, and remote learning and working. The 10 GHz band can be a viable alternative to fiber, where available, and other spectrum bands that may be congested. The regulatory scheme the Coalition has proposed is designed to protect federal and amateur users from harmful interference through an AFC system that will manage spectrum access. WISPA appreciates NTIA’s role in the spectrum sharing process and encourages its further cooperation with the Coalition and other federal interests.

Third, the FCC, in coordination with NTIA and the Department of Transportation (“DOT”), should finalize rules to enable unlicensed outdoor access to the 5850-5895 MHz band.²² Through the FCC’s grants of special temporary authority arising out of the increased demand at the start of the pandemic, hundreds of WISPA members have gained access to this band, without causing harmful interference to federal users. Equipment manufacturers that produce equipment

²⁰ News Release, *Resound Networks and Airspan Networks Successfully Test 1 Gigabit Per Second Fixed Wireless Access (FWA) Services using 6 GHz Spectrum* (June 1, 2022) available at [Resound Networks and Airspan Networks Successfully Test 1 Gigabit Per Second Fixed Wireless Access \(FWA\) Services using 6 GHz Spectrum \(businesswire.com\)](https://www.businesswire.com/news/2022/06/01/Resound-Networks-and-Airspan-Networks-Successfully-Test-1-Gigabit-Per-Second-Fixed-Wireless-Access-FWA-Services-using-6-GHz-Spectrum); News Release, *Gigabit 6GHz Fixed Wireless is a Reality* (May 23, 2022), available at [Gigabit 6 GHz Fixed Wireless is a Reality \(pr.newswire.com\)](https://www.pr.newswire.com/news-releases/gigabit-6ghz-fixed-wireless-is-a-reality-2022-05-23).

²¹ See Coalition Petition.

²² *In the Matter of Use of the 5.850-5.925 GHz Band*, First Report and Order, Further Notice of Proposed Rulemaking, and Order of Proposed Modification, ET Docket No. 19-138, 35 FCC Rcd 13440, 13441 (2020).

in the adjacent 5 GHz unlicensed band were able to quickly download firmware upgrades to enable use of the additional 45 megahertz. Once rules are finalized, geographic exclusion zones will be refined to more accurately reflect actual federal operations²³ and unlicensed access will not require prior FCC approval.

Fourth, the 3.1-3.45 GHz band is a prime candidate for allocation of 350 megahertz of mid-band spectrum, but policymakers must ensure that the band is broadly available. To do so, the entire band should be made available on a non-exclusive, shared basis with federal users, with appropriate interference protection standards enforced by an AFC system or similar dynamic frequency coordination system that restricts use in and around federal operations and maintains confidentiality where national security interests require. The benefit of this approach is accelerated access to the band for commercial purposes to support, among other things, expanded rural broadband deployments, without the need and expense of clearing federal incumbents and relocating their operations to another band. Because this band lies near the CBRS band that many of WISPA's members are using, it will undoubtedly become a workhorse for rural providers – if the regulatory framework does not mandate exclusive licensing of large geographic areas and/or large spectrum blocks for a large segment of the band. WISPA encourages NTIA to continue its dialogue with the Department of Defense (“DoD”) and other stakeholders in examining this band for commercial allocation.

Fifth, NTIA and FCC should examine the 7125-7250 MHz band to determine whether that 125 megahertz can be made available for non-federal use. In combination with the adjacent

²³ Letter from Charles Cooper, Associate Administrator, Office of Spectrum Management, NTIA, to Ronald Repasi, Acting Chief, Office of Engineering and Technology, FCC, dated September 8, 2020.

6 GHz band that the FCC recently opened up for unlicensed use, this additional 125 megahertz could enable the creation of a 320-megahertz channel for low-power indoor use.

Sixth, NTIA and the FCC should work closely to develop the coordinated sharing approach for the 37-37.6 GHz band.²⁴ This band offers high-capacity links that can be useful in serving densely populated urban areas and rural clusters. WISPA anticipates that millimeter wave bands will be increasingly critical for short-haul point-to-point connections and for IoT/IIoT.

Seventh, NTIA should continue to work with DoD and the FCC in limiting harmful interference to commercial broadband operations in the CBRS band. In recent months, commercial operations have been disrupted by testing of federal radar systems that share the band. While these testing operations are permissible under the FCC's rules, inland military bases testing during daytime hours occupied 100 megahertz of spectrum in large areas that do not account for terrain obstructions, resulting in long service disruptions to thousands of consumers that rely on CBRS for their broadband service. WISPA encourages federal agencies to explore ways to mitigate interference – for example, testing could be done overnight on less spectrum with a smaller exclusion zone that reflects terrain and clutter.

Lastly, from a programmatic perspective, WISPA encourages NTIA's leadership on intergovernmental coordination. The August 2022 Memorandum of Understanding (“MOU”) between NTIA and the FCC is a good and necessary start.²⁵ But from a process point of view, other federal agencies must be engaged so that agencies do not unreasonably delay FCC action

²⁴ *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, 8170-71 (2016).

²⁵ Memorandum of Understanding Between the Federal Communications Commission and the National Telecommunications and Information Administration, dated Aug. 1, 2022 (“NTIA/FCC MOU”).

(e.g., the 5.9 GHz band) or raise concerns long after the FCC adopts rules and assigns licenses (e.g., the 3.7-3.98 GHz band).

ii. **Medium-Term Objectives Should Focus on Identifying Federal Spectrum Needs**

In response to NTIA's request for comment on medium-term spectrum requirements, WISPA recommends that the federal government be pro-active in assessing ongoing and future spectrum needs, with a specific emphasis on whether older federal systems can be relocated to other bands as they reach end of life or as newer, more efficient technology becomes available for federal purposes. A more efficient allocation of spectrum can, over time, create more contiguous bands to handle greater capacity non-federal networks and reduce the need for geographic exclusion zones, large guard bands, or other sharing techniques. For example, if Terminal Doppler Weather Radar ("TDWR") facilities are upgraded, it may be possible to relocate those operations to other bands, thereby clearing the way for unlicensed use of 60 to 70 megahertz of spectrum in the unlicensed U-NII band for commercial use. This band segment is surrounded by unlicensed 5 GHz operations that are heavily used by WISPs to provide fixed wireless broadband service throughout the country, particularly in rural areas where wireline terrestrial options are limited or non-existent.

Going forward, work should be informed by standards development bodies, but should allow for innovation and proprietary uses, such as those that have enabled rural deployment on unlicensed spectrum and in CBRS. As a corollary, spectrum bands supporting legacy fixed wireless access technology should not be repurposed, as that technology remains viable with continued innovation by companies manufacturing proprietary equipment at competitive price points that enable more affordable and reliable broadband service on unlicensed spectrum.

Certainly, the Strategy should not require hundreds of WISPs to abandon spectrum bands, at considerable cost and disruption of service to consumers that may lack choice.

iii. Long-Term Spectrum Requirements Should Focus on Sustained Engagement with Stakeholders

The principles outlined in response to information on medium-term needs should continue into the longer term. WISPA views the *RFC* as a starting point to greater public engagement on spectrum issues. NTIA should recognize that its near-term Strategy must be flexibly applied going forward and avoid rigidity that can hamper progress. The Strategy should be a living, breathing document that NTIA and the public re-visit from time to time so that the Strategy reflects changes in consumer demand, federal spectrum needs and innovation.

B. There is a Lack of Affordable Spectrum Dedicated Solely for Fixed Wireless Deployment

i. A National Spectrum Strategy Should Recognize that Spectrum Allocations Can Accelerate Consumer Access to Reliable, High-Speed Fixed Broadband

NTIA, “in collaboration with the Federal Communications Commission and in coordination with its other federal partners – endeavors to identify at least 1,500 megahertz of spectrum for in-depth study to determine whether the spectrum can be repurposed for more intensive use.”²⁶ In connection with this effort, WISPA encourages a balanced approach that makes available licensed, unlicensed, and shared spectrum for commercial use. As discussed below, this process should include an audit of federal spectrum occupancy and a determination of when a particular federal technology is reaching the end of its useful life or the federal use can be migrated to other spectrum bands.

²⁶ *RFC* at 16245.

In Question 2, NTIA asks about the insufficiency of spectrum.²⁷ The current amount of commercial spectrum likely will be insufficient to meet future consumer demand.²⁸ This is especially true with respect to those consumers living in rural areas where consumer choice is limited, and in remote areas where there may be no options. In either circumstance, access to fiber may not be an option at present or in the foreseeable future given the much higher cost to deploy fiber in these areas or its unavailability due to supply chain delays. Fixed wireless access is the solution, either as a sole source of broadband access or as a competitive option.

In addition to the *amount* of spectrum that can be repurposed or shared through various methods, of equal if not greater importance is the *means* by which spectrum is made available. Although NTIA has often repurposed federal spectrum for non-federal use and the FCC has allocated thousands of megahertz of spectrum, these efforts have suffered from a major deficiency in implementing new spectrum allocations. There has been a decided emphasis on exclusive licensing for “flexible” use and proceeds for the U.S. Treasury through the use of auction procedures that foreclose smaller providers from a meaningful opportunity to acquire spectrum. With the single notable exception of CBRS, recent FCC spectrum auctions have devolved into spending contests between the extremely rich and the very wealthy – nationwide mobile carriers and cable operators – at the exclusion of smaller providers that seek spectrum for fixed services in rural areas.

The result of these unfortunate outcomes is that community-focused fixed wireless providers must largely subsist on unlicensed or shared spectrum. While unlicensed and shared spectrum enables reliable service in networks deployed by experienced WISPs using modern

²⁷ *Id.*

²⁸ *Id.*

technology,²⁹ rural consumers should not be an afterthought in a forward-looking strategy that should prioritize bridging the digital divide.

To address this inequity and the constraints it imposes on rural broadband deployment, a national spectrum strategy should embrace the allocation of spectrum strictly for fixed last-mile, point-to-multipoint operations. There are thousands of locations across the country where it will not be economical to deploy fiber, even after the Broadband Equity, Access, and Deployment (“BEAD”) program concludes. A national spectrum strategy should recognize that fixed wireless technology is providing reliable broadband service today, and can continue to reliably reach these locations with repurposed or shared spectrum, if properly allocated.

As discussed above, the 350 megahertz in the 3.1-3.45 GHz band is a prime candidate for reaching Americans living and working in rural and remote areas. This band can be made available for shared fixed use with appropriate safeguards to protect federal users from harmful interference.³⁰ Likewise, although it lacks the coverage benefits of lower-band spectrum, the 12.7-13.25 GHz band can be complimentary spectrum tool.³¹

ii. Current Secondary Market Rules Confer Only Modest Benefits

The FCC’s secondary market leasing, partitioning and disaggregation rules continue to be cumbersome and conservative, even following recent rule changes intended to create incentives for larger licensees to divest of spectrum in rural areas.³² The Strategy should explore additional

²⁹ See [Appendix A](#) for a sample of technology features that can ensure reliable broadband service.

³⁰ Such use does not require the same geographic exclusivity as mobile operation, whether or not fixed users are protected from interference from one another; if necessary, protection can be achieved via coordination, along the lines of Parts 90 and 101 of the FCC’s rules.

³¹ Reply Comments of WISPA – Broadband Without Boundaries, GN Docket No. 22-352 (filed Jan. 10, 2023).

³² *Partitioning, Disaggregation, and Leasing of Spectrum*, Report and Order and Second Further Notice of Proposed Rulemaking, WT Docket No. 19-38, FCC 22-53 (rel. July 18, 2022).

ways to increase spectrum use in rural areas through “use it or lose it” or “use it or share it” or other policies intended to discourage spectrum warehousing. To reduce transaction costs and waiting times, secondary market transactions could be migrated from the FCC’s Universal Licensing System to private exchanges, which would be required to report the transactions to the FCC in a manner similar to the “light-touch” leasing approach the FCC adopted for CBRS.³³

iii. **Repurposing Spectrum is One of Many Options Available for Increasing Spectrum Access**

Certainly, NTIA should examine whether, when, and to what extent spectrum for federal use can be repurposed for non-federal use. Spectrum clearing is both expensive and time-consuming, and is often not the best option, particularly given short-term and medium-term requirements. Therefore, it is incumbent upon NTIA and all federal agencies to prioritize dynamic spectrum sharing between federal and non-federal users, and also among non-federal users with differing business models. The SAS and the AFC system are no longer novelties, but are evolved spectrum sharing techniques that are helping to accelerate the availability and efficiency of spectrum.

NTIA and the FCC also should undertake a comprehensive analysis of the FCC’s “substantial service” and renewal standards to determine the extent to which they enable spectrum warehousing. While there has been modest implementation of the “use it or lose it” policy or reduced license terms in some bands,³⁴ stronger buildout incentives and penalties should be considered. And, if the spectrum is lost through failure to meet service obligations or renewal standards, the FCC should make that spectrum available to others as soon as possible. Reclaimed spectrum should not remain in the FCC’s inventory when it could be used by others.

³³ 47 C.F.R. § 1.9046.

³⁴ 47 C.F.R. §§ 95.1933(c) and 101.527(c).

C. The Strategy Should Identify Specific Spectrum Bands for Further Study

Question 3 asks about specific spectrum bands that should be studied for potential repurposing.³⁵ As discussed above, the 3.1-3.45 GHz band should be studied immediately for potential sharing between federal and non-federal users. As mid-band spectrum, this band offers the benefits of both capacity and coverage for point-to-multipoint service, and can be combined with other 3 GHz bands in the same equipment and with similar propagation characteristics to improve connectivity for rural consumers.

Also in the short-term, NTIA and the FCC should move forward to study the 10-10.5 GHz band for shared use for point-to-point operations. As discussed above, allocation of this band for non-federal and non-amateur uses can address the shortage of backhaul options in many rural areas. The specific rules proposed in the Coalition Petition ensure interference protection to all incumbent users through an AFC system.

As noted above, NTIA and the FCC should begin to study the 7125-7250 MHz band in the short term. There is also federal spectrum in the remainder of the 7 GHz band up to 8.4 GHz range where sharing could be possible. Such a spectrum mix is not dissimilar to the 6 GHz band where AFC-mediated sharing protects fixed point-to-point links. Uplinks are much less prone to interference, particularly if conducted power limits are in place.

Spectrum access models that could expedite or streamline the process include the SAS and AFC systems, which can enable dynamic sharing and can prioritize classes of users to avoid harmful interference. Models should consider clutter and obstructions, and any geographic exclusion zones should be reality-based to avoid over-protection of federal users at the expense of expanded consumer access.

³⁵ *RFC* at 16246.

D. NTIA Should Consider a Number of Factors in Identifying Spectrum for the Pipeline

Question 4 asks about factors that should be considered in identifying spectrum for the pipeline, and related questions about diverse spectrum access opportunities.³⁶ Long experience across different bands has shown that multiple variables significantly impact the timeline for identifying and repurposing spectrum. The Strategy can maximize the efficiency of the timeline by identifying the factors likely to have the largest impact, and then using those factors to rank spectrum bands in order of difficulty. The factors WISPA believes to be the most important are as follows.

i. Actual Current and Future Use Must be Audited

The most significant variable that can impact the timeline for repurposing spectrum is the actual extent and intensity of spectrum use by incumbent federal and non-federal users. Experience shows that it is impossible to understand actual use simply by reference to the Table of Allocations: that is, a given spectrum band may be allocated to a critical kind of use, but may only be used in a handful of facilities around the country or on a limited amount of spectrum, thus leaving the vast majority of the band fallow. Currently, however, most of NTIA's Federal Government Spectrum Use Reports are only updated through December 2015, and only cover spectrum up to 7125 MHz.³⁷ The FCC's Spectrum Dashboard, while perhaps a revolutionary tool in 2010, has not been updated for years, and only covers spectrum up to 3.7 GHz.

Accordingly, applying the principle that you must know your starting point if you want to know how to get somewhere, the Strategy must call for a national audit of actual spectrum use by federal and non-federal users, assessing the intensity of use of spectrum bands up to 80 GHz.

³⁶ *Id.*

³⁷ See <https://ntia.gov/other-publication/federal-government-spectrum-compendium>.

Such an audit, properly done, is likely to take a significant amount of time, and should not delay short- and medium-term steps to make spectrum available. Nevertheless, the federal government must update its understanding of its own use of spectrum as well as that of non-federal users for the 2020s and beyond. Ideally, for any given spectrum band, the audit would provide information about where spectrum is used, the amount of spectrum actually used, the intensity of that use, and whether that use is important to critical infrastructure, national security, law enforcement or public safety functions.

In particular, the national audit should review the geographic and spectral extent of use of bands allocated to federal use and bands allocated to non-federal use that are licensed on a nationwide basis. Vast swaths of spectrum are lying fallow because they are used only in a few parts of the country, or perhaps the federal government is only using a portion of the spectrum allocated to it. As has been shown through experience with CBRS, significant sharing opportunities can be made available even if certain geographic areas must be set aside for critical government uses.

While a national audit is essential for understanding current use, the pipeline must also consider future federal spectrum needs. Just as there is a pipeline for commercial use of spectrum, so too should there be a pipeline for future federal use, both for migration of incumbent uses and planned development of new uses. Necessarily, this may involve consideration of classified information that must be protected from unauthorized disclosure. As such, and given that future government use is a significant variable in spectrum planning, the federal government must prioritize the development of an internal protocol for the handling of classified information related to future spectrum use and planning to minimize the risk of future conflict as the pipeline identifies new bands for repurposing.

ii. **Migration and Replacement of Federal Systems Must Account for End of Life and Modern Technologies**

Experience also shows that the cost of migrating federal users is perhaps the single biggest determinant of whether a spectrum band can be repurposed. And yet all too often, proposals for repurposing run up against an estimate that repurposing will cost billions or tens of billions of dollars with little in the way of detail, much less opportunity to explore more cost-efficient alternatives. The Strategy must try to change this dynamic and thus provide more of a collaborative process towards identifying the costs and opportunities of repurposing spectrum bands.

Accordingly, when identifying spectrum for the pipeline, the Strategy should consider several different issues related to the equipment federal users deployed within the spectrum bands.

- Is the equipment past or nearing end of life? In some cases, ground radar or other installations may be decades old, and new spectrum uses or different technology may achieve the same function more efficiently for both federal and non-federal users. If the federal government must plan to replace equipment used in a given spectrum band, that would be an ideal opportunity for NTIA to consider whether new equipment or technology would enable use of less spectrum, or a migration to an entirely new spectrum bands.
- Even if the equipment is not near end of life, was the equipment sufficiently designed to mitigate undesired signals from outside the federal user's assigned frequencies? While the FCC has not generally imposed specific design or performance criteria on receivers, it recognizes that receiver design is a crucial part of making spectrum available for new services.³⁸ NTIA should echo this basic engineering reality – transmitter characteristics are only part of solving interference issues, and significant amounts of spectrum can be made available by implementing resilient receiver design. The pipeline should thus consider whether existing equipment might be better-filtered or otherwise protected to promote sharing and otherwise free up spectrum that is otherwise being wasted on unnecessarily large geographic or spectral protection zones.

³⁸ See, e.g., Public Draft, Policy Statement, *Principles for Promoting Efficient Use of Spectrum and Opportunities for New Services*, FCC-CIRC2304-01, ET Docket Nos. 23-122, 22-137 (Mar. 30, 2023), ¶¶ 26-32. The FCC will voted on the Policy Statement at its Open Commission Meeting on April 20, 2023.

- Are there multiple redundant systems used in the spectrum band that might be consolidated with new equipment?

iii. **Do Not Require Clearing Amounts for Spectrum Auctions**

For the auction for the 3450-3550 MHz band that the FCC conducted in 2021 (Auction 110), Congress required NTIA to provide the initial relocation or sharing costs and timelines for the band.³⁹ NTIA estimated those costs to be \$13.4 billion for 100 megahertz of spectrum. Under the Spectrum Relocation Fund established by the Commercial Spectrum Enhancement Act (“CSEA”) federal agencies operating on certain frequencies that have been reallocated from federal to non-federal use must be reimbursed for the cost of relocating their operations. The CSEA, as amended by the Spectrum Act,⁴⁰ requires that the total cash proceeds from any auction of eligible frequencies to equal at least 110% of the estimated relocation or sharing costs NTIA provided to the FCC, and it prohibits the FCC from concluding any auction that falls short of this amount.⁴¹ As a result of these requirements, the FCC then set a reserve price of more than \$14.7 billion.⁴² In order to meet this mandatory reserve price, the FCC decided to auction the spectrum in 10-megahertz blocks in PEAs – very large, multi-county geographic areas that are much larger than smaller providers require to serve their local communities. As a result, small providers – many of which were successful in the 2020 county-based CBRS auction that had no such reimbursement requirement – were largely shut out of Auction 110. The reimbursement

³⁹ See, e.g., Letter from Carolyn Roddy, Deputy Assistant Secretary for Communications, NTIA, to the Hon. Ajit Pai, Chairman, FCC, dated January 14, 2021. The letter cites Section 113(g)(4)(A) of the National Telecommunications and Information Administration Act as the legal authority for its estimated costs and timelines.

⁴⁰ 47 U.S.C. §§ 309(j), 923(g) and 928.

⁴¹ 47 C.F.R. § 1.2104(c)

⁴² See FCC Public Notice, *Auction of Flexible-Use Service Licenses in the 3.45-3.55 GHz Band for Next-Generation Wireless Services*, AU Docket No. 21-62, DA 21-655 (rel. June 9, 2021), at 41 ¶ 119.

requirement acted as a driver of the auction mechanism in order to ensure that the FCC met the \$14.7 billion cost.⁴³

Congress should give serious thought to amending federal statutes to avoid a repeat of this outcome. If the federal government is forced to receive reimbursement from FCC spectrum licensees, that has substantial consequences on the way spectrum is allocated. First, estimated relocation and sharing costs could essentially mandate an auction of spectrum. Second, the auction design itself may dictate outcomes that foreclose auction participation by smaller providers and virtually ensure continuous concentration of licenses by larger, nationwide providers that, in light of the license costs and relocation expenses, population-based buildout rules and the need to return value to public shareholder, have little incentive to deploy service in rural areas. Consideration of other financial sources to cover federal relocation and sharing costs should be included in the Strategy.

iv. The Strategy Must Promote Diverse Spectrum Access Opportunities

In Question 4, NTIA asks whether the Strategy should “promote diverse spectrum access opportunities including widespread, intensive, and low-cost access to spectrum-based services for consumers.”⁴⁴ WISPA submits that the Strategy must do so as otherwise it will unnecessarily and severely limit spectrum that could be brought to market to provide spectrum-based services.

It is beyond argument that entirely clearing spectrum and then auctioning spectrum it on an exclusive, licensed basis to companies willing to invest has been crucial to technological

⁴³ In a perfect world, a national spectrum strategy could have considered the 530 megahertz of spectrum in the 3.45-3.55, 3.55-3.7 GHz and 3.7-3.98 GHz bands holistically and at the same time. Such a study quite possibly would have led to different policy outcomes and the acceleration of deployments in areas that lack broadband choice. But federal spectrum use has not been assessed or audited in a more encompassing or strategic way, and is a cautionary tale for the Strategy NTIA now intends to create and implement.

⁴⁴ *RFC* at 16246.

development and economic growth in the United States. The Strategy should assume that spectrum will continue to be made available on this basis when appropriate. And, where spectrum is auctioned, smaller geographic areas should be made available.

But the Strategy must not, however, limit itself to *only* an exclusive licensing approach. As experience has shown, clearing an entire band in all geographies may be impractical as the cost of relocating incumbents entirely may be prohibitive. Large numbers of incumbents can increase the complexities and cost of relocating dramatically. As a result, sharing strategies will have to be used, and will result in more widespread and lower-cost use of spectrum. As was shown with CBRS, relocating all of the incumbent federal users would have taken far too long and been far too expensive. However, by requiring that the band be shared on a geographic and spectral basis under the control of the SAS, the FCC was able to make the spectrum available to a diverse set of service providers in relatively short order. Both large, licensed carriers using Priority Access Licenses (“PALs”) and smaller operators using a combination of PALs and General Authorized Access (“GAA”) have access to the spectrum, and have been able to deploy spectrum to the benefit of consumers and businesses across the country. Accordingly, when identifying spectrum bands for repurposing, the Strategy must include a requirement that NTIA and the FCC compare timelines and costs for clearing as opposed to sharing approaches, and implement sharing when spectrum can be made available significantly faster or at much lower cost.

Of course, in doing so, the Strategy should avoid recommending a “one size fits all” sharing model. Whether and how sharing of federal spectrum might best be implemented will vary depending on the characteristics of the spectrum, incumbent use and national security concerns. For any band, then, the Strategy should recommend that NTIA and the FCC define

use case-specific tolerances for interference and exercise flexibility in designing sharing regimes. The Strategy also should recommend that the timeline for repurposing spectrum account for incumbent use cases, as dynamic systems like AFC can quickly authorize use that will not harm incumbent operations.

With regard to low-cost access, WISPA emphasizes that such access is particularly important in the sparsely populated areas in which most of WISPA's members operate. Because these areas will have fewer customers to distribute the cost of spectrum and infrastructure, the Strategy should encourage the development of allocation mechanisms that foster flexible sharing approaches for all use cases.

E. WISPA Supports NTIA's Proposed Definition of Sharing

WISPA supports NTIA's proposal, in Question 6, to define "sharing" as "optimized utilization of a band of spectrum by two or more users that includes shared use in frequency, time, and/or location domains, which can be static or dynamic."⁴⁵ As noted above, WISPA strongly supports spectrum sharing regimes, which result in faster deployment of spectrum at lower cost. WISPA proposes that NTIA acknowledge in the Strategy technologies, innovations and processes that facilitate spectrum sharing.

NTIA asks what "technologies, innovations or processes are currently available to facilitate spectrum sharing."⁴⁶ Because many WISPs operate in relatively sparsely populated areas, they need to be able to take advantage of shared and unlicensed spectrum to constrain deployment costs. As a result, WISPA's members have extensive experience with spectrum

⁴⁵ *Id.*

⁴⁶ *RFC* at 16246.

sharing and believe there are a number of technologies that should be acknowledged in the Strategy.

- SAS and AFC systems: These systems are automated frequency coordinators that either directly and dynamically reallocate channels or provide critical information about channels and power availability within a band to minimize or avoid harmful interference. The SAS is used in the CBRS spectrum at 3.5 GHz, and the AFC system is used in the 6 GHz spectrum. While this technology was speculative only a little more than a decade ago, at this point spectrum sharing technologies like the SAS have already been successfully deployed across the United States and the AFC system is in the process of making 6 GHz spectrum available to multiple service providers.
- Geographic exclusion zones: Geographic reuse is perhaps the oldest spectrum sharing methodology, but continues to be a vital process for maximizing spectrum use. Moreover, as filtering technology improves, more bands become open to sharing on a broader basis as exclusion zones shrink. Geographic exclusion zones may continue to be an important means of protecting fixed federal facilities.
- Incumbent Informing Capability (“IIC”): As described in a recent NTIA paper, IIC “is a mechanism for more reliably informing “new entrants” in a shared spectrum band when incumbent federal systems are operating in close proximity and thus need to be protected.”⁴⁷ Use of the spectrum is controlled through an enhanced, near-real-time Spectrum Coordination System. As described by NTIA, IIC could replace certain sharing techniques such as the environmental sensing capability (“ESC”) currently used for CBRS.

⁴⁷ M. DiFrancisco et al., “Incumbent Informing Capability (IIC) for Time-Based Spectrum Sharing,” NTIA Report (Feb. 22, 2021) at 1.

F. Assessment of Spectrum Access Approaches

In Question 7, NTIA asks for the use cases, benefits and hinderances of different types of spectrum access approaches.⁴⁸ WISPA has provided some thoughts on exclusive use versus shared use above, and provides the following regarding the specific approaches listed by NTIA.

i. Exclusive-Use Licensing

Generally, there are two models of exclusive-use licensing: broadcasting/cellular and point-to-point/point-to-multipoint.

Broadcasting/Cellular

The broadcasting/cellular model depends on transmitters to cover a given geographic area with multiple users or receivers of the service. The main use cases for these kinds of networks are in radio and television broadcasting, and cellular radio networks. The primary benefit of this kind of exclusive use licensing is that it minimizes or eliminates the risk of interference, thus ensuring that the service will be available to the end user. Another benefit is that it allows service providers to accumulate a nationwide service footprint using standardized equipment relatively easily, and thus facilitates economies of scale and scope, increasing coverage and lowering operating costs. Moreover, the license itself has standalone intrinsic value.

The hinderance of this type of exclusive-use licensing, however, is that it can significantly increase the cost of spectrum beyond the capability of small companies to compete. Because a license confers the exclusive right to use frequencies in an area, and thus restricts the supply and drives up the cost of spectrum in the area, it can be virtually impossible for smaller companies to afford to purchase spectrum at auction in metropolitan areas. But even in rural areas where most WISPs operate, speculation can unnecessarily drive up the cost of spectrum.

⁴⁸ *RFC* at 16246.

And poorly designed auction frameworks and buildout rules can lead bidders to purchase exclusive rights across broad areas but only serve the densest part of those areas, resulting in gaps of unused but perfectly good spectrum.

Point-to-Point/Point-to-Multipoint

Instead of authorizing exclusive use over an entire area, this model authorizes transmission paths between specific sites, and grants the license holder the right to use that path and be free of interference to the path. The main use cases for this model of exclusive-use licensing are land mobile operations, WISPs, backhaul for networks, and private networks such as those used by utilities to transmit information about the utility infrastructure and operation.

As opposed to the broadcasting/cellular model, the main benefit of this model is that it maximizes spectral efficiency because it licenses specific paths rather than coverage of entire areas. Because the exclusivity is much more constrained, the value of that exclusivity is much smaller, and thus the cost of the spectrum is much more manageable for smaller companies. The nature of the model also lends itself to relatively inexpensive coordinated first-come, first-served licensing, rather than competitive auctions. Another benefit is that the holder of the licenses cannot exclude others from obtaining frequencies in nearby areas, and thus the model eliminates the potential geographic gaps caused by the broadcasting/cellular model.

The main hinderance of this model is that it does require system-by-system coordination, which can be quite complex in dense areas. However, for companies that make frequent use of this kind of license, there are numerous systems that have grown up around the frequency coordination process that serve to constrain costs, and in less populated areas coordination is far less likely to present any significant deployment issues. In some cases, this process can be automated.

ii. Dynamic Spectrum Sharing

Implementation of a dynamic spectrum sharing regime in the CBRS band has resulted in a variety of different use cases. By establishing GAA under a licensed-by-rule regulatory regime, the FCC unlocked a significant amount of value in spectrum that would have otherwise remained unused across much of the United States. GAA can be authorized by the SAS on available channels in the upper 50 megahertz without PAL access, in a minimum of 30 megahertz in the lower 100 megahertz in the same manner; or opportunistically where a PAL is not operating.

- WISPA members use the GAA tier, often in combination with PALs, to provide significant additional capacity to their fixed wireless networks in rural areas, allowing faster speeds to residences and small businesses across the country.
- Service providers and businesses also use the GAA tier in urban and suburban markets to boost capacity for fixed wireless, 4G LTE and 5G networks.
- Businesses, universities, and other private entities are using the GAA tier to deploy private wireless networks for business, industrial and educational operations, or add capacity to existing networks. This spectrum is particularly important to entities operating facilities in areas with limited access to broadband and cellular networks.

In addition to the CBRS band, white spaces in the 470-608 MHz band are also dynamically shared, as broadcast auxiliary services take precedence over unlicensed uses. While this spectrum could provide additional capacity to fixed wireless networks in rural and remote areas, it has not yet seen the intensity of use experienced in the CBRS band.

There are numerous benefits to dynamic spectrum sharing, especially as compared to predefined sharing. In many predefined sharing environments, users are segregated by geography or frequency permanently, and this can result in wasted spectrum – exclusive use zones may have been poorly drawn and included areas where the licensee never intended to deploy service; one license holder may never actually build out, or build out to only a fraction of their licensed spectrum; technology may develop that allows narrower exclusion zones; and so

on. Because predefined sharing establishes a particular spectral sharing environment for the foreseeable future based on a certain set of assumptions about technology and use, when those assumptions prove to be inaccurate, then spectrum gets wasted.

Thus, the primary benefit of dynamic sharing is that it creates an extremely efficient sharing environment that, immediately or within a reasonable time, allows users to access additional spectrum unless a higher priority use is present. Moreover, this kind of dynamic, real-time, or near-time interference management can quickly accommodate technological or operational developments that change the interference environment. As discussed above, dynamic sharing can be an important tool for enabling shared use, and thus a significant benefit of dynamic sharing is that it can help make spectrum available at a far lower cost than might otherwise be the case if incumbents had to be relocated.

By making significant amounts of spectrum available at lower cost, it does have several hinderances as compared to other spectrum access methodologies. Necessarily, all users must deploy frequency agile equipment, which can impose additional deployment costs. Moreover, users that are relying on dynamic sharing to provide a certain amount of capacity in wireless networks must, necessarily, ensure that they have access to alternative frequencies to provide continuity of service. Finally, and conversely to the value of exclusive-use licenses noted above, users of spectrum provided by dynamic sharing may find that potential investors will not ascribe inherent value to the use of such spectrum as compared to exclusive use licensing.

While these hinderances are outweighed by the benefits users are seeing in the availability of the GAA tier in CBRS, WISPA believes there is room for improvement. The Strategy should acknowledge and incorporate the following:

- Geographic exclusion zones applicable to sharing regimes should, to the maximum extent possible, be based on real world experience. Thus, they should be defined by

the actual interference and be reassessed over time, as technology develops, and experience accumulates. Otherwise, dynamic sharing regimes will be constrained by some of the weaknesses of predefined sharing.

- The ESC network used to facilitate dynamic sharing in CBRS has been subject to blocking interference from service in the immediately adjacent 3.45 GHz band. Thus, the Strategy should acknowledge the importance of both protecting sensing technologies and exploring alternatives, such as the IIC suggested by NTIA discussed above.
- Sharing regimes should only be implemented with adequate consideration of out-of-band emission issues, given that most sharing regimes will be implemented in spectral environments that are already crowded.

G. Incentives to Facilitate More Robust Sharing Arrangements

i. Relocation Costs

In Question 8, NTIA asks whether the “current process for reimbursement of relocation or sharing costs adequately incentivize the study or analysis of spectrum frequencies for potential repurposing?”⁴⁹ As explained above, if relocation costs must be covered by auction proceeds, it may be impossible to accommodate lower-cost sharing in the spectrum band. Experience shows that this would foreclose participation by smaller providers and further concentrate licenses in the hands of larger, nationwide providers that have little incentive to deploy service outside of the dense population areas they usually target. When NTIA and FCC assess spectrum bands for repurposing, they must balance the costs of relocation and cost recovery mechanisms against the opportunities for more diverse and broadly available low-cost service made available by dynamic sharing regimes.

ii. Opportunistic Use

As discussed above, dynamic spectrum sharing technologies were entirely speculative a decade ago; and now are making available spectrum to smaller providers that otherwise would

⁴⁹ *Id.*

not have had the opportunity to access this spectrum. This unlocks value in spectrum that would have otherwise gone unused and results in more capacity at a lower price to American consumers. While WISPA has noted areas where sharing technologies and methodologies can be improved, these implementation issues are few and very narrow. Certainly, successful implementation of sharing technologies has shown that longtime opponents of sharing were wrong – it is feasible, and a valuable tool in the federal toolkit for repurposing spectrum.

Accordingly, the Strategy should acknowledge the important role of dynamic spectrum sharing technologies for making spectrum available at a low cost to diverse service providers, and commit to continued support of research, development and standards to continue to improve these technologies.

Pillar #2 – Long-Term Spectrum Planning

A. Outreach to Affected Stakeholders Should Be Broad and All-Inclusive

As a threshold step, NTIA should engage in broad outreach to maximize participation in the establishment of the Strategy by all interested parties that may have a stake in the formulation of future spectrum policy. Such outreach should be fully transparent and allow for ample opportunity for all stakeholders to participate in the submission of comments and the development of proposals through follow-up listening sessions and roundtables. The agency may want to seek additional means to disseminate notice of commenting opportunities and offer extended comment deadlines of 45 to 60 days to maximize the opportunity of interested parties to evaluate proposals and provide comprehensive input.

A variety of mechanisms should be used to gather and discuss long-term spectrum planning as a means of maximizing participation and facilitating exchange of ideas among stakeholders. For example, following initial comments that may highlight new issues or

disagreements, NTIA should provide follow-up opportunities for additional comment, including responses to draft proposals derived from the initial round of comments. This process can be enhanced through public listening sessions and roundtables focusing on specific spectrum needs or usage of particular frequency bands.

Interested parties should also be encouraged to meet directly with NTIA staff to foster increased understanding of critical needs and sharing issues involving shared federal and non-federal bands. Industry and government spectrum experts should be included in these meetings to facilitate negotiated solutions to resolve any disagreements based on objective science rather than permitting impasses to persist due to obstructive resistance.

B. NTIA Should Seek to Gather a Broad Range of Data on an Annual Basis to Track Spectrum Utilization and Emerging Needs Based on Both Industry and Government Projections

In considering “long-term” spectrum needs, NTIA should look to expected needs within the 7-10-year time frame, as well as longer term projections for needs within 10-15 years and 15-20 years, to the extent that stakeholders are able to provide advance indications of such long-range spectrum requirements and articulate reasons for beginning the process of evaluating potential frequency bands to meet these needs.

The necessary starting point for analyzing these long-term needs is to establish a baseline of current usage and spectrum occupancy. This process should begin with a thorough spectrum occupancy audit, a detailed survey of how each band of interest is currently being used, the intensity of spectrum use, the degree to which current users are approaching maximum effective use of the spectrum and projected future growth rates for spectrum usage, including a detailed description of the key factors and data used to prepare these assessments. This audit must cover

both federal and non-federal users and assess projected future use on a band-by-band basis and include the following critical information for each band –

- the entities or agencies assigned or authorized to use the band;
- the total amount of spectrum allocated to each user, in megahertz, reported by geographic area (at the county level or smaller subdivision);
- the current scope of transmissions using the spectrum by time, frequency and bandwidth;
- the type of spectrum use (commercial, utility, industrial, private, Internet of Things, etc.);
- the total number (by type) of intentional radiators deployed and used in the band;
- to the extent available, the type of unlicensed intentional radiators authorized operating in the band;
- for authorizations granted to non-federal users on an exclusive geographic basis (including all commercial mobile radio service or flexible use licenses), contour maps that depict signal coverage and strength of signals operated on a point-to-multipoint basis or as mobile base stations;
- channel occupancy levels in urban, suburban, and rural areas; and
- the tolerance of the existing service to interference from co-channel and nearby-frequency operations.

Once this comprehensive spectrum audit is completed, NTIA and the FCC should make the information gathered publicly available via an Internet-accessible website and update this information as quickly as possible to reflect changes in any allocation or assignment. The information should be comprehensively reviewed and updated no less frequently than on a biennial basis.

All long-term evaluations of spectrum requirements should include consideration of whether operations in underutilized bands may be reduced or relocated as existing equipment reaches the end of its useful life. Long term planning should also consider more generally the possibility of shifting frequency bands to opportunistic use where current and predicted use does not exhaust the resource. An opportunistic “use it or share it” approach allows existing users to

maintain their extant operations to the level required while introducing new users to make efficient use of frequency bands that otherwise would not be employed to the maximum extent possible. The SAS developed for operation in CBRS, for example, has proven effective in coordinating opportunistic use of locally unused spectrum. Various additional mechanisms can be utilized to implement greater spectrum access, including simplified secondary market leasing. Given some incumbents' reluctance to lease auctioned spectrum in areas where it is unused, opportunistic use by others should be explored, as well as the possibility of partitioning license areas to remove areas where the spectrum is not in use after a given time.

All private sector and federal stakeholders need to be involved in and contribute meaningfully to this process. Large federal users of spectrum resources, such as DoD, should embrace spectrum sharing and be proactive in realistically assessing future needs and possibilities to relocate or consolidate existing uses. Federal users should also make efforts to realistically assess the potential interference impact of additional spectrum use rather than seeking to exclude new uses based on inadequately documented concerns about potential interference.

C. Successful Repurposing of Spectrum Requires Close and Consistent Collaboration Among Federal and Non-Federal Stakeholders, the FCC, and NTIA, to Achieve Consensus and Clear Timetables for Improved Spectrum Utilization

WISPA applauds NTIA's efforts to update and enhance its working relationship with FCC under the NTIA/FCC MOU signed last August. As Assistant Secretary Davidson observed upon the prior announcement of the new spectrum coordination initiative between the agencies that preceded the revised MOU, this agreement between the agencies promises "to build a common vision for spectrum management and coordination that serves federal users, private

actors, and the American people.”⁵⁰ This cooperative approach provides a key underpinning for establishing a National Spectrum Strategy. In keeping with this understanding, all federal agencies that use spectrum resources should work closely to establish mechanisms for greater spectrum sharing and reallocation. This includes greater efforts to avoid delays in the repurposing process, when applicable.

NTIA should also take steps to avoid the problem of post-auction agency objections and retrenchments that have arisen in the past with respect to frequency reallocations, including both the 5.9 GHz band and the 3.7-3.98 GHz C-band. When agencies raise new complaints at later stages in the process, especially after a spectrum auction has taken place, it erodes the confidence of stakeholders and the public at large in the consistency and regularity of spectrum policy.

One example involving an agency’s aggressive opposition to changes in spectrum use is DOT’s resistance to the partial reallocation of the 5.9 GHz band.⁵¹ DOT should not continue to stand in way of needed changes in the 5.9 GHz spectrum allocation to improve utilization unless safety of life is involved. And it should not be enough to present this concern as a talismanic obstacle to change, the DOT should accept the obligation to present clear and credible technical information to demonstrate that non-federal regulatory changes would have an adverse impact on public safety.

⁵⁰ FCC/NTIA Joint News Release, “FCC, NTIA Establish Spectrum Coordination Initiative,” at 1 (rel. Feb. 15, 2022).

⁵¹ *See, e.g.*, Letter from Steven G. Bradbury, General Counsel, Department of Transportation, to Ajit Pai, Chairman, Federal Communications Commission, ET Docket No. 19-138, at 2 (Nov. 6, 2020) (“DOT remains convinced that all 75 megahertz (MHz) of spectrum previously allocated for V2X should remain available for that purpose. Reducing that allocation by more than half, to 30 MHz, jeopardizes both the existing deployment of, and innovation in V2X technology.”)

D. The Federal Government and the Private Sector Should Work Together to Establish Working Groups to Investigate and Validate Proposed Band Sharing Scenarios

One of the critical impediments to more efficient band sharing is the tendency for technical experts retained by different stakeholders to submit conflicting reports arguing on one hand for restricted spectrum use to protect incumbent users or on the other for significant expansion of band use based on the asserted absence of harmful interference from potential new users. Achieving optimal spectrum efficiency requires mechanisms to cut through the extreme views to establish a real world understanding of the prospects, pitfalls and best practices associated with changes in frequency use. NTIA and the FCC together can assist in facilitating greater cooperation among interest holders by establishing technical working groups to assess critical factors impacting the ability for different services, air interfaces, and technologies to co-exist in the same spectrum bands. For example, cooperative efforts among both federal government and private sector engineers could build better signal propagation models to be used for assessment of potential harmful interference. Existing industry-standard models, for example, fail to account for actual clutter (such as trees and buildings) in a path. At microwave frequencies, such obstructions can have a profound impact on signal strength.

E. Federal Spectrum Managers Should Take a Multi-Faceted Approach to Achieving Improved Spectrum Utility and Efficiency

The federal agencies should undertake a common effort to encourage interoperability and technical standards that would facilitate compatibility and sharing among different types of spectrum users. At the same time, proprietary and innovative technologies should be facilitated rather than discouraged, when appropriate.

The concept of establishing spectrum “neighborhoods” should be explored much more fully. Indeed, WISPA has advocated for this approach in recent years in the Television White

Spaces proceeding as a means of improving spectral efficiency.⁵² In the end, the FCC did not authorize this approach in that proceeding, which has contributed to significant underutilization of the band. Accordingly, NTIA and the FCC together should revisit and devote resources to studying this concept further and implementing it in those bands where harmonizing spectrum allocations to cluster compatible uses can lead to improved utilization and performance.

There are other bands that can be identified currently that have significant potential for greater spectrum optimization. At 5 GHz, for example, there is a potential to relocate TDWR facilities to other bands, if feasibility is demonstrated, and repurpose this mid-band spectrum for more intensive use. The 4.8-4.94 GHz band is another case where federal point-to-point and air to ground operations may not make use of the entire band in much of the country.

Pillar #3 – Unprecedented Spectrum Access and Management Through Technology Development

A. Innovations in Spectrum Access and Management Have and Will Remain Essential Features of Spectrum Policy and Planning

In response to Question 1, WISPA recommends that next-generation capabilities for spectrum management models should focus on frequency agility, as a complement to dynamic sharing. Frequency-agile devices are more able to maintain service when the frequencies on which they have been operating becomes needed by a higher-priority user, such as a federal incumbent. Also, spectrum management models should consider the relationship between dynamic sharing and active beamforming antennas. These can work with dynamic spectrum management systems to minimize power in the direction of protected incumbents while providing service in other directions. In addition, current propagation models should be

⁵² Comments of the Wireless Internet Service Providers Association, ET Docket No. 20-36 (filed May 4, 2020).

improved to better account for clutter, terrain and other environmental features to reduce over-protection of federal and non-federal users, and enable spectrum to be shared more efficiently.

These tools will increase the amount of usable spectrum and maximize its utility.

B. The National Spectrum Strategy Should Promote Policies that Enable Development of New and Innovative Spectrum Uses

In addition to the other policies discussed elsewhere in these Comments, WISPA recommends two other policies to enable development of new and innovative uses of spectrum. First, policies should recognize different levels of “acceptable” interference based on the applications and technology, as opposed to adopting a simple signal-to-noise ratio. Different technologies have different tolerances for loss. Modern packetized radios, for instance, typically employ forward error correction and adaptive coding and modulation to optimize performance in the presence of moderate interference. Existing interference models often do not take this into account and consider any interference to be as catastrophic as it would have been in the past when analog frequency-division systems were used to carry telephone calls.

Second, policies should minimize rivalry through intelligent spatial sharing to avoid or minimize the size of geographic exclusion zones. Individual receivers can be protected by a dynamic spectrum management system by taking predicted loss along the actual path into account, rather than using simple radii, administrative boundaries, or other non-technical means of establishing exclusion zones. Area protection can, however, remain in place to protect incumbent mobile and airborne operations.

C. How the Government Can Promote Research Into, Investment In, and Development of Technological Advancements in Spectrum Management

As explained above, the FCC has acknowledged the importance of receiver design in making new spectrum available going forward. Incumbent users should not be permitted to

block new uses of spectrum simply because they have an embedded base of poorly designed receivers. Easily overloaded receivers can also pose a significant threat to public safety and national security. And yet such receivers are allowed to persist in the market.

By acknowledging that receiver design is one half of the problem in solving interference issues, the Strategy can create a more flexible environment for spectrum repurposing. The Strategy should thus state that NTIA must take a leading role in coordinating federal support of research into, investment in and development of technological advancements in interference resistant receiver design. Specifically, the Strategy should propose that, where appropriate, the federal government should incorporate resilient receiver standards into federal acquisition requirements, and that the federal government should provide funding and support for the development of resilient receive standards.

D. WISPA Supports Adoption and Implementation of Incumbent Informing Capability to Support Spectrum Sharing Among Federal and Non-Federal Users

WISPA is pleased that NTIA is pursuing incumbent informing capability (“IIC”) to better enable sharing between federal and non-federal users.⁵³ IIC is much simpler to implement than the ESC that was adopted for CBRS and avoids problems inherent in spectrum sensing such as false-positives that disrupt communications. Non-federal users do not need direct access to classified data, as the AFC or other dynamic sharing mechanism should be able to manage authorizations in a safe way. That said, in designing IIC systems, non-federal users need to know what threshold they need to protect and IIC systems should not “over inform” or utilize informing capabilities exceeding federal needs. WISPA looks forward to providing technical assistance and input to the federal government as it continues to study IIC. Industry standards

⁵³ *RFC* at 16247.

development groups could greatly assist in creating a common set of standards and best practices related to both IIC systems and receiver standards.

Implementation Plan

As soon as possible after issuing the National Spectrum Strategy, NTIA should announce a detailed plan establishing a timeline for the achievement of the critical benchmarks required to execute the strategy. WISPA believes it is important in the initial 12-24 months to accomplish the following key steps:

- Resolve as expeditiously as possible the 5.9 GHz proceeding and open 500 MHz of spectrum in the 10 GHz band for point-to-point secondary use on a shared basis with federal and amateur users as described in the Coalition Petition;
- Schedule multiple public listening sessions and roundtables among stakeholders on the best approaches to implementing the near-term elements of the Strategy;
- Solicit public comment on initial draft plans for spectrum transition in bands identified for near term reallocation or enhanced use;
- Initiate a comprehensive spectrum occupancy audit covering both federal and non-federal users;
- Establish methods to encourage flexible leasing methodologies for licensed spectrum with light touch regulation for underused and unused geographic areas and with unused spectrum being made opportunistically available for near-term use with appropriate protections; and
- Bands newly made available should be valued for maximizing their potential service to the public more than for potential auction revenue.

Conclusion

WISPA asks that the recommendations and rationale discussed above are incorporated into the National Spectrum Strategy, for the benefit of unserved and underserved consumers and businesses, while maintaining a forward-looking approach that promotes innovation in spectrum sharing and management.

Respectfully submitted,

**WISPA –
*BROADBAND WITHOUT BOUNDARIES***

April 17, 2023

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Appendix A

Unlicensed Spectrum

Unlicensed spectrum is reliable

- Frequency agility across a large amount of spectrum enables providers to find “clean” channels
- Can move to other frequencies if there is clutter, terrain, environmental or other noise issues
- Licensed and unlicensed equipment often use the same Software Defined Radio
 - Broadband service using unlicensed spectrum has flexibility to move to other channels/frequencies
- Fixed wireless technology, and unlicensed spectrum in particular, has always kept pace with consumer demand (i.e., “adaptability to changing end-user requirements”)
 - Low churn
 - Increasingly faster speeds
 - Technological innovation

Reliability is a function of network design

- Low churn rates in FWA networks illustrate reliability, and is a key performance indicator for the unprecedented amount of private capital that has fueled FWA expansion in the last two years
- The FCC has made, and will continue to make, unlicensed spectrum available for fixed wireless service, creating more “clean” spectrum to meet present and future demand
- There is a large toolbox of solutions for spectrum management, including:
 - Frequency agility across a large amount of spectrum enables providers to find “clean” open channels
 - Network densification, in which the provider uses all or almost all of the unlicensed spectrum in a given market, is common among providers of FWA service to create de facto geographic exclusivity much like a spectrum license
 - Antenna use and directionality
 - Directional antennas are commonly used and enable the signal to focus the beam in a particular direction on specific frequencies
 - Beamforming (electronically guided) antennas can further mitigate interference potential by steering the beam to its intended destination
 - Antenna arrays provide a greater surface area that allows for more efficiency in transmit and receive antennas and can reduce interference
 - Timing techniques
 - Locational GPS with timing allows automated coordination at the transmit antenna (i.e., alternate transmit/receive based on local environment and activity)
 - Timing schemes (e.g., near and far TDD)

- Duty cycle compatibility
- Listen-before-talk
- Frequency re-use and channel agility
 - Channel re-use enables more “clean” channels for interference avoidance
 - Channel agility and diversity enables provider to simply re-tune the equipment so it operates on “clean” channels that will not cause or suffer harmful interference
- Noise cancellation technologies in new generation of equipment
- FWA providers voluntarily coordinate operations using a variety of different mitigation techniques
- Effective network planning and management; and coexistence planning techniques
- Service outages often caused by external events
 - Natural disasters (though the FCC has determined that FWA (licensed or unlicensed) is more reliable than aerial fiber on wood poles)
 - Fiber cuts upstream