

WifiForward National Spectrum Strategy Implementation Comments

OVERVIEW

WifiForward appreciates the opportunity to respond to the National Telecommunications and Information Administration’s (“NTIA”) Request for Comment on the implementation of a National Spectrum Strategy (“Strategy”).¹

WifiForward is a broad coalition of companies, organizations, and public institutions supporting Wi-Fi and shared spectrum technologies.² The coalition filed comments on the development of the Strategy in 2023, focusing on the importance to the country of ensuring a path forward for unlicensed sharing technologies, and in particular, Wi-Fi.

Wi-Fi is an American success story. Wi-Fi, and the unlicensed spectrum on which it operates, add about a trillion dollars to the U.S. economy annually, with projections that its economic contributions will reach \$1.58 trillion by 2025.³ Wi-Fi’s economic success is driven by American consumers’ heavy demand for and reliance on it – supporting more than 85% of mobile traffic and a growing majority of *all* internet traffic today – and its low barriers to entry, which allow for essentially unlimited innovation and technological development. As total wireless data usage is projected to increase by five times from 2018-2026, Wi-Fi is expected to deliver 90% of that growth, mostly due to recent advances in Wi-Fi performance, reliability, and security that make it a most cost-effective, reliable, and widely used connectivity platform, overwhelmingly preferred by consumers at home and at work.⁴

U.S. companies are the world’s leaders in Wi-Fi chipset production, modular radios used in other manufacturers’ finished products, and enterprise equipment. Those same U.S. companies are the

¹ *National Spectrum Strategy*, The White House (Nov. 13, 2023), available at https://www.ntia.gov/sites/default/files/publications/national_spectrum_strategy_final.pdf (“National Spectrum Strategy” or “Strategy”).

² Our members are Amazon.com, Inc., Charter Communications, Inc., Comcast Corporation, and NCTA – the Internet & Television Association (“NCTA”) plus numerous partner companies, consumer organization and trade groups that support widespread deployment and use of Wi-Fi.

³ See *Global Economic Value of Wi-Fi 2021-2025*, Wi-Fi ALLIANCE, 11, (2021)https://www.wi-fi.org/system/files/Global_Economic_Value_of_Wi-Fi_2021-2025_202109.pdf. (Global Economic Value)

⁴ There is already a rich ecosystem of devices that use Wi-Fi for consumers to interact with in the residential and enterprise setting. The Wi-Fi Alliance notes it has certified more than 80,000 unique devices since certifications began more than 20 years ago. Of course, the market is continuing to grow. See *ODM and EMS Wi-Fi Devices Market (2023-2033)*, PERSISTENT MARKETS RESEARCH, <https://www.persistencemarketresearch.com/market-research/odm-and-ems-wi-fi-devices-market.asp> (last visited Dec. 26, 2023) (projecting a combined annual growth rate of 15.5% through 2033).

leading participants in global standards setting and shape future generations of Wi-Fi. Moreover, U.S. broadband service providers universally offer Wi-Fi to consumers as part of broadband packages, and, as a result, Wi-Fi carries far more traffic than all other wireless technologies combined.⁵ Supporting Wi-Fi, therefore, should be at the heart of NTIA's implementation of the Strategy.

WifiForward congratulates NTIA on the release of its Strategy and considers the implementation of the entire Strategy to be of utmost importance. Our comments here, however, will focus on NTIA's identification of the 7 GHz frequency range for possible Federal/commercial use. We focus on this frequency range because the 7 GHz band is the only location available in the foreseeable future to support the Nation's ever-growing unlicensed spectrum needs. While there are many bands on the table for licensed spectrum, there is no "Plan B" for heavily used Wi-Fi services that carry the bulk of data in our homes, businesses, and community anchor institutions. Promptly and strategically allocating more unlicensed spectrum is vital to preserving and expanding these Wi-Fi services so they keep up with increased data traffic flows and innovative technologies. WifiForward recommends that NTIA recognize that the 7 GHz frequency range is best understood as two separate bands that should receive different treatment:

- **The Lower 7 GHz band:** NTIA can best achieve the goals of the Strategy in the short term by prioritizing study of the 7125-7250 MHz band, where substantial technical investigation has already been completed.⁶ Federal use is similar to the commercial Fixed Service ("FS") operations below 7125 MHz which operate in a band that has recently been opened for unlicensed operations by the Federal Communications Commission ("Commission"). We recommend that NTIA's implementation of the Strategy should work to identify this band to the Commission for sharing on an unlicensed, LPI basis by mid-2024. Importantly, identifying this 125-megahertz range for unlicensed sharing will allow completion of a currently incomplete 320-megahertz Wi-Fi 7 channel that was stranded by the Commission's *6 GHz Report & Order*. The "low hanging fruit" opportunity to complete this channel, and the proximity of the Lower 7 GHz band to the country's most important Wi-Fi band, makes an unlicensed designation substantially more valuable than any other possible commercial use – and unlike the displace-and-auction strategy favored by the dominant wireless carriers, it would allow Federal incumbents to maintain their current operations uninterrupted.

⁵ *Broadband Stats: a World of Wi-Fi*, NCTA (June 22, 2023), <https://www.ncta.com/whats-new/broadband-stats-a-world-of-wi-fi>. Notes that on average Wi-Fi carries more than 80% of the data consumed on mobile telephones. Individual carriers report even higher offloading statistics.

⁶ For example, *Unlicensed Use of the 6 GHz Band*, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 3852 (2020) ("6 GHz Order") at 112-150 contains an exhaustive review of record evidence amassed concerning the coexistence of indoor Wi-Fi with fixed links, and concluding that based on the power levels and technical rules the Commission imposed for Wi-Fi operations in 6 GHz, harmful interference is "unlikely to occur". This view was affirmed by the D.C. Circuit in *AT&T Servs. v. FCC*, , 21 F.4th 841 (D.C. Cir. 2021) ("AT&T Court Case") (the court remanded a single issue brought by broadcasters, which has since been resolved in the *Unlicensed Use of the 6 GHz Band*, Second Report and Order, Second Further Notice of Proposed Rulemaking, and Memorandum Opinion and Order on Remand, FCC 23-86, ET Docket 18-295, (rel. Nov. 1, 2023) ("6 GHz Second Order").

- **The Upper 7 GHz band:** NTIA can best achieve the goals of the Strategy in the longer term by conducting further study of the Upper 7 GHz band for sharing on an unlicensed basis, considering the use of spectrum sharing techniques, including those similar to those used by unlicensed devices in the 5 and 6 GHz bands – and how this approach would protect Federal systems and facilitate their future deployment. The physics of Wi-Fi in the 6 GHz band under the Commission’s conservative power rules have demonstrated that, as industry migrates to higher frequencies, more access points will be necessary to accommodate differences in signal propagation, and that means more densely packed Wi-Fi access points will need access to more channels. The opportunity for a shared Federal/commercial use of the Upper 7 GHz band using Wi-Fi would benefit US consumers for years to come.

An implementation of the Strategy that (1) positions the Commission to open the Lower 7 GHz band’s 125 megahertz for LPI unlicensed use as soon as possible, with a Commission rulemaking to begin in 2024, by leveraging the Commission’s in-depth analysis at 6 GHz and (2) studies Federal sharing with unlicensed technologies in the Upper 7 GHz band as a next step will achieve NTIA’s strategic goals of ensuring that Federal agencies have access to the spectrum they need to achieve their missions, while ensuring that the private sector has access to spectrum to support innovation, both, as the Strategy states, “now and into the future.”⁷

DISCUSSION

The Nation Needs Additional Spectrum Resources to Support Wi-Fi

Unlicensed spectrum offers low barriers to entry for innovators working at the device, network, and applications layers. It enables easy and convenient internet access for consumers, operating at the edge of nearly all broadband connections whether wired or wireless. In fact, the majority of all internet data transits over Wi-Fi.

The exceptional growth of Wi-Fi has produced great benefits for the country. First, unlicensed bands support more innovation than bands governed by any other spectrum-assignment method, including licensed-exclusive bands, based on the number and diversity of products in the market. Second, Wi-Fi powers the widest array of consumer and enterprise uses, and is the core wireless technology for schools, healthcare facilities, governments, transportation hubs, businesses of all types, and homes. Third, unlicensed bands produce enormous economic benefits for the country, with measures as high as \$1.6 trillion by 2025.⁸

The continued ability of Wi-Fi to meet these rapidly growing needs depends on it having access to adequate spectrum resources. Critically, Wi-Fi requires both wide channels and channel diversity. Wi-Fi 7, which is now rolling out to provide Americans with better performance, better security, and less latency, is optimized for 320-megahertz channels.

⁷ National Spectrum Strategy at 3.

⁸ Global Economic Value at 8.

The Commission adopted rules in 2020 to open the 6 GHz band for unlicensed technologies, a critical decision that addressed a nearly two decades-long period in which the U.S. did not open any new unlicensed bands. But the growth of Wi-Fi, the need for multiple 320-megahertz channels, and the strict rules adopted by the Commission mean that the 6 GHz band will not alone address U.S. consumer and enterprise demand for Wi-Fi and other unlicensed technologies. Specifically, the 6 GHz band provides only three 320-megahertz channels. Wi-Fi requires more than these three channels to achieve the channel diversity needed to serve consumers and enterprises due to rapid developments in bandwidth hungry applications and video technologies, as well as increased diversity in the requirements of new devices that will populate our homes and workplaces. Wi-Fi 7 has new management capabilities to easily handle device density, widely varying latency requirements including very low latency, and high bandwidth applications, but its capabilities will be curtailed – and consumer experience will suffer – if there is insufficient spectrum to match ever-growing demand and innovation.

Some parties attempt to argue that unlicensed operations already have adequate spectrum resources compared to licensed operations. But their apples-to-oranges comparisons are flawed. While the Wi-Fi industry is proud of its ability to share spectrum with incumbents, that does not change the fact that sharing means the spectrum allocated to unlicensed is, from an unlicensed perspective, impaired compared to exclusive spectrum bands. Notably, the Commission’s rules limit operation even in the 6 GHz band’s three 320-megahertz channels to indoor areas at power levels that are four times lower than the Wi-Fi access points Americans use today in the 2.4 GHz and 5 GHz bands, meaning that operators need more access points (“APs”) and more channel diversity than in the past. The Commission also adopted rules to allow outdoor use at higher powers with large exclusion zones governed by Automated Frequency Coordination (“AFC”) systems. But it permitted this operation only in half of the band, producing only one 320-megahertz channel, while the exclusion zones will diminish the geographic availability of this one 320-megahertz channel in thousands of areas around the country. The bottom line is that the 6 GHz band is critical to the ability of Wi-Fi to serve consumer and enterprise demand, but it is not sufficient. Wi-Fi’s role in carrying more traffic than any other wireless technology, the rapid growth of demand for Wi-Fi and other unlicensed technologies, and the limits of the 6 GHz band combine to mean that unlicensed technologies require a spectrum pipeline as much as, if not more than, traditional cellular technologies.

Supporting Wi-Fi is an essential part of NTIA’s broader innovation strategy. By prioritizing Federal/unlicensed sharing in the Lower and Upper 7 GHz bands, positioned immediately adjacent to the 6 GHz band, the U.S. will have created the most powerful broadband platform for device and applications innovation in the world. U.S. companies can then confidently project the development of new devices and applications that will support American technological leadership at home and around the world. This strategy is necessary because:

- The number of connected devices at home will continue to grow, as the Internet of Things continues to deploy in the economy. Moreover, these devices will continue to require highly diverse connectivity characteristics that Wi-Fi 6E and 7 were designed to manage, including low-latency transmissions on the order of a few milliseconds.
- In addition, new applications will take advantage of developments in highly reliable broadband enabled by Wi-Fi 6E and 7, a suite of immersive (360-degree) technologies, AI,

and the inexorable march of downstream video through 4K to 8K to 16k and beyond. The consequences of giving applications developers access to a U.S. market offering high-quality broadband, including robust Wi-Fi at the edge, will turbocharge innovation.

- For enterprise wireless, Wi-Fi continues to have a dominant footprint, and that dominance is projected to continue as Wi-Fi uniquely offers cost-effective, powerful indoor networking capability. In fact, new generations of Wi-Fi are designed to help enterprises address problems of density in end devices, highly variable traffic characteristics such as low-latency communications, roaming, and more, especially as robotics and AI continue to make inroads into business operations.
- In addition, broadband access technologies are poised to reach 10 gigabits per second in the next few years, and 25G fiber technologies are on the near horizon. To ensure that consumers can take full advantage of this network innovation and investment, we must remain committed to a spectrum pipeline for Wi-Fi, which is how consumers connect in their homes, businesses, anchor institutions and more.

In contrast, licensed (“IMT”) use of the 7 GHz band is a poor choice. These technologies, largely dominated by foreign companies, will not support U.S. technological leadership, and will not benefit U.S. consumers as much as unlicensed can, as described above. Additionally, there is no global ecosystem at 7 GHz for IMT, and therefore no economies of scale for network equipment or handsets. A decision to study the band for IMT would mean the spectrum will sit idle for years hoping for an equipment ecosystem to arrive, compared to Wi-Fi’s immediate ability to serve consumers. Furthermore, IMT has never demonstrated its ability to share with large deployments of fixed wireless links, commercial or Federal. As a result, studying the band for IMT implies clearing of Federal systems and Federal management of fixed link migration to an as-of-yet unidentified band. IMT proponents are likely to argue Federal fixed links are unimportant, that agencies can discard them and instead use fiber, or that they can be forcibly relocated into the 6 GHz commercial band (becoming customers of the very same companies that would have displaced them). The consequences of such a move are unknown as Federal users would need to operate with commercial users under Commission licensing rules to evolve and expand their networks. A host of administrative problems would need to be solved as well, including the consequences of Federal links being reclassified as commercial systems and appearing in Commission licensing databases, being subject to commercial renewal rules, and many other regulations that have not applied to agencies in the past.

The Lower 7 GHz Band: 7125-7250 MHz

Federal Coordination Benefits

The most important step NTIA can take in implementing the Strategy in a way that recognizes the importance of Wi-Fi to the country is to prioritize the coordination work needed to open the Lower 7 GHz band (7125-7250 MHz) for unlicensed operations. WifiForward recommends that NTIA’s first priority should be to complete work with Federal incumbents to identify sharing parameters for this band. In doing so, NTIA should consider all of the technical work already filed with the Commission as part of the 6 GHz proceeding.

The rules the Commission established in 2020 were based on years of intense technical work studying interactions between unlicensed devices and commercial FS operations that are very

similar to the links used by Federal incumbents in the Lower 7 GHz band. The Federal incumbents using the Lower 7 GHz band appear to use the same technology as used by commercial FS operations in the 6 GHz band, built by the same manufacturers that sell technology for commercial links at 6 GHz. The Commission's 6 GHz in-depth technical interference analysis therefore appears to be directly applicable to Lower 7 GHz Federal incumbents, and has the added virtue of being settled law.⁹ Moreover, the Federal Table of Allocations reveals a natural breaking point at 7250 MHz, because spectrum from 7125-7250 MHz is allocated to Federal FS on a primary basis, while above 7250 MHz, the Federal Table reveals a heavier presence of various primary satellite services not present below 7250 MHz. Notably, the few Federal non-fixed line systems in the Lower 7 GHz band¹⁰ are already operating with emissions produced by Federal fixed line deployments. As the studies in the Commission's docket have illustrated with respect to satellite uplink,¹¹ unlicensed use is unlikely to make it any more difficult for these services to continue, particularly given the mitigations detailed in the Commission's 6 GHz Report and Order and its rules, as well as follow-on decisions implementing the AFC and VLP.

WifiForward members are eager to work with NTIA to validate these assumptions and to complete any technical work needed to confirm that Wi-Fi can coexist with these Federal operations. This analysis can be accomplished far more quickly than any other possible approach as there is ample technical evidence to draw from in the Commission record. This would make the administrative burden of evaluating coexistence in the band far less onerous than virtually any other spectrum named in the Strategy,¹² and therefore it is an obvious candidate for advancement.

This approach will deliver benefits to the country far more rapidly than (1) inappropriately combining the Lower 7 GHz band with bands above 7250 MHz that have very different incumbent environments, (2) a clear-and-auction approach that would displace Federal operations and take far too many years to address American's broadband needs, or (3) an unnecessary and time consuming process of studying an unlicensed sharing mechanism or power levels that are different than those adopted by the Commission in 2020. For these reasons, prioritizing the study of the Lower 7 GHz band for unlicensed use consistent with the 6 GHz band can be an immediate "win" for the country and NTIA.

⁹ *6 GHz Order at 7, reversed in part, aff'd in part and remanded, AT&T Court Case at 853-54 (affirming 6 GHz Order and reversing and remanding to address a single issue of whether to "reserve a sliver of the 6 GHz band for licensed mobile operation"). The remand was dispensed with in the 6 GHz Second Order at 213.*

¹⁰ The EESS allocation from 7190-7235 MHz and 7235-7250 MHz is used only for tracking, telemetry and command for the operation of spacecraft. Moreover, the Federal Table of Allocations notes contain a specific disclaimer about satellite receivers not being protected from future fixed or mobile uses. For space research at 7190-7235 MHz, there are no more than 5 earth stations whose earth to space emissions must be protected, and for 7145-7190 MHz, only one location that requires protection. This is not different in kind than the MSS uplink in 6 GHz – industry has seen, and addressed, this problem before.

¹¹ *6 GHz Order at ¶¶171-173 (examining coexistence with satellite and radio astronomy).*

¹² WifiForward notes that there is a significant head start on analysis for the 3.1-3.45 GHz band as well, due to the Emerging Mid-band Radar Spectrum Study (EMBRSS) that has now concluded.

Commercial Benefits

Importantly, identifying this 125-megahertz range for unlicensed use will allow completion of a currently incomplete 320-megahertz Wi-Fi 7 channel. As discussed above, the country requires additional 320-megahertz channels to achieve the lower latency and channel diversity needed to meet exponentially growing consumer and enterprise Wi-Fi needs. This 320-megahertz channel was stranded because the Commission understandably set the upper bound of its *6 GHz Report & Order* at 7125 MHz because the Commission focused the rulemaking on commercial bands, over which it had exclusive decision-making authority. The addition of the 125 megahertz in the Lower 7 GHz band would allow radio manufacturers to complete a new non-overlapping 320-megahertz wide channel for Wi-Fi networks – moving the country from three Wi-Fi 7 channels to four. This spectrum would also create an entirely new 160-megahertz-wide channel, raising the number of these channels from seven to eight. And the number of 80-megahertz-wide channels, expected to be widely deployed for enterprises, would rise from 14 to 16. Permitting this channel optionality and meeting channel diversity requirements to account for the skyrocketing number of Wi-Fi devices in homes and enterprises, applications requirements, and unlicensed device types would greatly benefit the country.

The value of completing the otherwise wasted 320-megahertz channel, access to the channel optionality described above, and the proximity of the Lower 7 GHz band to the existing 6 GHz band, makes an unlicensed designation of these frequencies substantially more valuable to consumers and the country than any other possible commercial use – and unlike the displace-and-auction strategy favored by the dominant wireless carriers, it would allow Federal incumbents to maintain their current operations uninterrupted.

Importantly, IEEE 802.11 standards for Wi-Fi 6E and Wi-Fi 7 already include channel plans that extend up to 7250 MHz. Moreover, chipset manufacturers have confirmed that their existing chipsets can run up to 7250 (and beyond).¹³ This means by not opening 7125-7250 MHz to unlicensed use, the country would allow important radio capabilities to stand idle, even as channel diversity is diminished.

Finally, it is important to recognize that seeking a different band to meet consumer and enterprise Wi-Fi needs is not the answer. First, there simply is no other unlicensed band on the table in the mid-band. Standards bodies, chipmakers, and regulators do not have a backup plan if the 7 GHz band is not opened for unlicensed. Second, even if another band were somehow identified, Wi-Fi devices would then need to add a completely new radio or radios to service this spectrally distant band. This would add substantial cost and create unnecessary networking complexity compared to operations in a band immediately adjacent to the existing 6 GHz band. Third, a frequency range that is positioned on a continuum from the 5-6 GHz range provides a consistent user experience in terms of device range and other operating parameters compared to a device that would need to switch between radios with very different operating behavior. NTIA efforts to form

¹³ Broadcom National Spectrum Strategy Comments at 3-4, Docket No. NTIA-2023-0003 (filed Apr. 17, 2023) (“Broadcom Comments”); Intel also advocated for unlicensed up to 7250. Intel National Spectrum Strategy Comments at 9, Docket No. NTIA-2023-0003 (filed Apr. 17, 2023). In fact, there was broad support for 7150-7250 as an unlicensed band. In addition to the chip manufacturers, Amazon, Charter, Comcast, the Dynamic Spectrum Alliance, Federated Wireless, the Public Interest Spectrum Coalition, WISPA, and Wi-Fi Alliance endorsed this view.

as much of a contiguous band as possible will deliver consumers and businesses with a band plan that allows Wi-Fi to continue to be the country's most critical wireless link for broadband.

The Upper 7 GHz Band: 7250-8400 MHz

As a second step, WifiForward recommends that NTIA's implementation plan for the Strategy examine Federal/unlicensed sharing of the Upper 7 GHz band. Today's 6 GHz unlicensed chipsets can operate up to 7625 MHz.¹⁴ While additional spectrum means new commercial equipment certifications, the technology itself is already in place. In contrast, not studying, and therefore preventing Commission consideration of permitting, unlicensed use up to 7625 MHz *if achievable*, means the U.S. would be leaving important opportunities on the table. Even above 7625 MHz, to the extent there are opportunities for unlicensed sharing, those opportunities can drive future innovation in Wi-Fi chipsets and should be studied. Industry is already acutely aware of how valuable the 7 GHz band could be to support US broadband and innovation policies. WifiForward urges NTIA to evaluate the upper 7 GHz band for unlicensed use.¹⁵

WifiForward recognizes that because these coexistence scenarios in the upper 7 GHz band have not previously been studied, this part of the NTIA's evaluation may take longer, which is why NTIA should target 7125-7250 MHz for a faster track.

CONCLUSION

The National Spectrum Strategy, along with the Implementation Plan that NTIA plans to release in March 2024, are vitally important to ensuring that spectrum resources are used wisely and efficiently. An implementation plan that (1) places a high priority on the Lower 7 GHz band (7125-7250 MHz) by leveraging the Commission's in-depth analysis at 6 GHz with a goal of enabling a Commission rulemaking to begin in mid-2024, and (2) that studies Federal sharing with unlicensed technologies in the Upper 7 GHz Band as a next step, will achieve NTIA's strategic goals of ensuring that Federal agencies have access to the spectrum they need to achieve their missions, while ensuring that the private sector has access to spectrum to support innovation, both "now and into the future." WifiForward members stand ready to work with NTIA on a successful implementation of the Strategy.

Respectfully submitted,

WIFI **FORWARD**

¹⁴ Broadcom Comments at 3-4.

¹⁵ Public information does not provide a helpful roadmap for WifiForward to suggest how the upper 7 GHz might be segmented and studied. On the basis of the Federal Table of Allocations alone, there are primary satellite downlink services from 7250 -7900 MHz. Beginning at 7900 MHz, the Table indicates that satellite services are configured for uplink in the band up to 8400 MHz, with the exception of Earth Exploration Satellite services, which are downlink. There is also an allocation for FS, either primary or secondary, throughout. Without more knowledge of how the bands are actually used, it is difficult to formulate a recommendation for how the band might be studied for the purposes of the National Spectrum Strategy.