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Development of a National Spectrum Strategy) NTIA–2023–0003
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**COMMENTS OF
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TABLE OF CONTENTS

INTRODUCTION AND SUMMARY	1
PILLAR 1 – THE SPECTRUM PIPELINE.....	4
A. The way we build a spectrum pipeline must advance and adapt as the Nation’s wireless ecosystem grows and diversifies.....	4
B. NTIA should include licensed-shared bands in the spectrum pipeline.....	6
C. NTIA should include unlicensed bands in the spectrum pipeline.....	12
D. NTIA should evaluate the need for additional licensed-exclusive spectrum.....	15
PILLAR 2 – NTIA’S LONG-TERM SPECTRUM PLANNING PROCESS	20
PILLAR 3 – PROMOTING TECHNOLOGY DEVELOPMENT	23
CONCLUSION.....	25

INTRODUCTION AND SUMMARY

NTIA's development of a National Spectrum Strategy is crucial at a time when America's spectrum needs are growing and diversifying, making improved access to this resource imperative. As the *Request for Comments* recognizes, this Strategy must identify (1) bands for near-term action, (2) a plan to meet spectrum needs into the future, and (3) ways to spur and support more efficient use of spectrum.¹ A Spectrum Strategy that meets all three of these objectives will lay the groundwork for federal and private investment and innovation for many years to come.

Achieving NTIA's goals will require an "all of the above" approach to spectrum use. In addition to supporting federal needs, the National Spectrum Strategy must support commercial operations through licensed-exclusive, licensed-shared, and unlicensed access. A Strategy that relies on all of these spectrum access frameworks is the best way to enable access for a diverse set of users and foster innovation and competition for the many private companies working to build the Nation's wireless networks.

NCTA member companies, for example, are working hard to deploy next-generation wireless networks to serve their customers and to bring new competition to a heavily concentrated wireless marketplace. To do so, they rely on licensed-exclusive, licensed-shared, and unlicensed bands. For more than ten years, Comcast, Charter, and Cox have provided their broadband customers with CableWiFi® service over a wireless network of millions of Wi-Fi access points across the Nation. Smaller cable providers like Midco have invested in fixed

¹ See *Development of a National Spectrum Strategy*, Request for Comments, Docket No. NTIA-2023-0003, 88 Fed. Reg. 16244, 16244 (Mar. 16, 2023) ("*Request for Comments*").

wireless solutions, using licensed-shared spectrum, to extend broadband service to places where traditional network buildouts are costly, including to serve farms and other rural customers that can be miles apart from each other. In 2017, cable companies began offering mobile wireless service. Today, Comcast and Charter are the fastest growing retail mobile wireless companies in the country, each with over five million mobile subscribers, and are growing faster than the incumbent mobile wireless providers. With Cox Communications' announcement of the national launch of its mobile service in January of this year, the cable industry's commitment to wireless continues to grow.

Critically, cable's wireless offerings integrate licensed-exclusive, licensed-shared, and unlicensed networks to deliver robust high-capacity service—a true all-of-the-above strategy. Charter's Wi-Fi network, for example, connects 500 million devices and 85% of the mobile traffic consumed on Spectrum Mobile phones. Likewise, the number of devices connected to Comcast's Wi-Fi has skyrocketed since 2018 as Xfinity households connected nearly 1 billion devices, and more than 80% of traffic from Xfinity Mobile phones is carried over Wi-Fi. And our members continue to invest in their wireless businesses. In the Federal Communications Commission's ("FCC") 2020 auction for licenses in the 3.5 GHz Citizens Broadband Radio Service ("CBRS"), Charter, Comcast, and Cox were three of the top five winning bidders, respectively spending \$464 million, \$458 million, and \$212 million to acquire 210, 830, and 212 licenses that will help enable them to meet the growing demand for wireless connectivity. Making use of innovative spectrum policies and allocation frameworks, cable companies are able to offer consumers another choice for mobile services at competitive prices. NCTA members thus strongly support a National Spectrum Strategy that continues to give the country access to vital spectrum resources using licensed-exclusive, licensed-shared, and unlicensed frameworks.

Conversely, a Strategy elevating the identification of new licensed-exclusive bands over other approaches would not reflect the reality of today's wireless ecosystem, in which a significant majority of mobile traffic runs on Wi-Fi, private 5G access for American manufacturers, schools, hospitals, municipalities, farms, and more depend on shared spectrum frameworks, and greenfield spectrum is increasingly scarce or non-existent. Rather, it would undermine the Nation's economic, innovation, and competition goals.

Wireless technologies, applications, and expectations have evolved substantially, and the Nation's Spectrum Strategy must account for these changes in order to promote innovation; pervasive, accessible, and reliable connectivity; and economic growth. Consumer demand for high-throughput, low-latency wireless service requires a variety of approaches to complement the macro cell (high-site, high-power) model typical of licensed-exclusive spectrum. Fortunately, unlicensed networks and technologies have grown to become the workhorse of the U.S. wireless ecosystem, handling far more traffic than all licensed-exclusive networks combined. And new technologies are advancing coexistence among different groups and types of users, making it possible to open previously inaccessible bands for new commercial services. Because finding valuable spectrum unencumbered by existing users is nearly impossible now, and will not become easier in the future, the United States must increase its use of these sharing technologies. In the past, there was a perception that exclusive licensing and the business models of the largest mobile wireless carriers were the most important element of the Nation's spectrum strategy. But, as demonstrated by American consumers' increasing reliance on Wi-Fi and the influx of diverse innovators and market participants in the CBRS band, that is no longer the dominant view, and a Strategy that fails to recognize and adapt to change will not serve the public interest today or tomorrow.

NCTA’s comments will discuss how NTIA can pursue an all-of-the-above approach that reflects today’s wireless marketplace and advances each of the three pillars of the National Spectrum Strategy outlined in the *Request for Comments*.

PILLAR 1 – THE SPECTRUM PIPELINE

NTIA plans to “identify at least 1,500 megahertz of spectrum for in-depth study to determine whether that spectrum can be repurposed to allow more intensive use” and seeks comment on “what requirements ... a spectrum pipeline needs to address.”² A spectrum pipeline is extremely important for identifying bands that can be put to use in the short term and laying the groundwork to study other bands for use in the medium and longer term. To be successful across these timeframes, a spectrum pipeline will need to be innovative, forward-thinking, and suited to current and future uses and technologies. That means an approach that balances American consumers’ connectivity needs and demands, the needs of federal operators, and the physical and propagation characteristics of each band.

A. The way we build a spectrum pipeline must advance and adapt as the Nation’s wireless ecosystem grows and diversifies.

In the past decade, increasing access to spectrum has become increasingly difficult, wireless technologies and consumer demand have evolved, and innovative new spectrum-management approaches have emerged. The Nation’s spectrum strategy must keep pace with these changes.

To ensure that happens, and in response to **Question 4** of the *Request for Comments*, NTIA must use every tool at its disposal as it creates a spectrum pipeline that includes specific plans for licensed-shared and unlicensed bands and lays the groundwork for innovation and to

² *Id.* at 16245.

meet marketplace and technological changes. Each of these approaches will play a necessary role in deploying new wireless technologies and services across the country.

Decades ago, the Nation's original goal for commercial wireless networks was to encourage high-site, high-power networks engineered with the primary objective of achieving wide coverage with as few towers as possible. Congress and the FCC therefore prioritized spectrum policies that favored licensed-exclusive clear-and-auction approaches, large geographic license areas, and higher power levels. Over the past 30 years, the FCC auctioned the PCS, AWS, 600 MHz, 700 MHz, 2.5 GHz, 3.7 GHz, and other bands based on those policies. Although this strategy ignited the first generations of mobile wireless services, it did so at a cost. Auction designs, policy decisions, and technical rules favored the business models of the largest traditional wireless carriers and their chosen technologies over all other uses of, and technologies and access models for, commercial spectrum. As a result, today, just three carriers hold the vast majority of exclusively licensed spectrum. The FCC's recent Communications Marketplace Report found that AT&T, Verizon, and T-Mobile together hold approximately 78% of all spectrum included in the FCC's spectrum screen, measured on a MHz-POPs basis.³

Today, the country's wireless needs are much different than in previous years. American consumers rely on Wi-Fi for a large majority of their mobile traffic, and billions of connected home, healthcare, digital learning, work, and other devices, as well as American manufacturers and industry, rely on licensed-shared frameworks for private 5G services tailored to meet their specific needs. As a result, any policy that is over-reliant on exclusive licensing would be counterproductive. Consumers, enterprises, and government agencies now demand a

³ *Communications Marketplace Report, 2022 Communications Marketplace Report*, FCC 22-103, GN Docket No. 22-203, ¶ 86 (rel. Dec. 30, 2022).

heterogeneous network ecosystem that supports many technologies, business models, and applications. The Nation's goals are no longer limited to wide coverage at any cost, but now must address the need for increased capacity, high throughput, and low latency, the need to support wireless technologies far beyond mobile phone service, and—critically—the need to advance spectrum sharing, as yesterday's clear-and-auction strategy is not sustainable on its own. We must continue to adopt policies that give mobile wireless networks tools to reach areas of the country that still lack adequate coverage. But the coverage problem in many of these areas is not due to an absence of licensed-exclusive spectrum. It is due to non-deployment of spectrum that has already been exclusively licensed, with the large license areas and high power that licensed-exclusive advocates support. More licensed-exclusive spectrum will not address this problem.

In short, the Nation's spectrum policy can continue to support exclusive licensing, but it must also recognize that to meet today's needs a pipeline must include specific and substantial licensed-shared and unlicensed bands.

B. NTIA should include licensed-shared bands in the spectrum pipeline.

With the growing need for spectrum and absence of greenfield spectrum, the clear-and-auction approach is not sustainable as the default method of introducing new licensed operations. Explicitly incorporating a licensed-shared model into the Nation's spectrum strategy would maximize the utility of spectrum in an increasingly complex and crowded environment. It would also maximize wireless competition by making spectrum resources more accessible to a wide range of users, such as manufacturers, healthcare providers, schools, factories, and municipalities, and allow these entities to use spectrum in a manner that is tailored to their unique needs without being forced to rely on a nationwide carrier to do so.

Spectrum sharing is a flexible concept that can be applied differently to a variety of unique environments. Technological and regulatory innovations provide policymakers and other stakeholders, including network designers and operators, a wide set of sharing tools, as NTIA's proposed definition of "spectrum sharing" reflects.⁴ We note, however, that spectrum sharing includes permitting multiple services or uses, rather than just multiple users, and it can extend beyond "shared use in frequency, time, and/or location domains, which can be static or dynamic,"⁵ to include sharing via appropriate power limits or limitations like indoor-only use. Those mechanisms can be used in licensed or unlicensed contexts. The CBRS band, for example, makes licensed-shared commercial use viable alongside federal use through the combination of dynamic sharing, smaller geographic license areas, and lower power limits than in many licensed-exclusive bands. And the FCC's innovative approach to unlicensed operations in the 6 GHz band uses a more static database-oriented approach to sharing for standard-power operations, combined with broader use via fixed indoor-only operations at lower power.

The licensed-shared framework—using smaller geographic license sizes, with lower-site, lower-power transmitters compared to licensed-exclusive bands—offers significant benefits. First, it makes spectrum accessible to more users and to new and diverse entrants, promoting innovation and competition. Auctions of large license areas designed for nationwide carriers' high-power transmitters are often too expensive to permit meaningful competition by other bidders. Moreover, these large license areas force most other companies to bid on licenses that include areas that are inconsistent with those companies' customer bases, making these licenses unattractive at any price. These represent significant barriers to entry.

⁴ *Request for Comments* at 16246 ¶ 6.

⁵ *Id.*

Auctions for licensed-shared bands, by contrast, attract many diverse participants, and as a result, disseminate licenses across a wider range of applicants for a variety of important and innovative purposes, such as creating private wireless networks and competitive mobile wireless networks (*e.g.*, 5G and beyond). Licensed-shared spectrum also promotes better coexistence among federal and commercial incumbent users and new entrants. In fact, licensed-exclusive advocates generally acknowledge that, for their high-site, high-power approach to work, existing users must either be cleared or tolerate the likelihood of disruption from their high-site, high-power operations. Key to promoting more competitive auctions—and permitting commercial service where it might otherwise be untenable—are licenses with smaller geographic areas and lower power levels.

The three-tier spectrum-sharing regime in the CBRS band illustrates the potential of licensed-shared spectrum. The CBRS band structure reserves Tier 1 for incumbent operations with protected status, including Department of Defense (“DoD”) radars; Tier 2 for priority access licenses (“PALs”), auctioned to private users and managed so that the use does not interfere with incumbent operations; and Tier 3 for flexible, licensed-by-rule general authorized access (“GAA”). Operations in each tier must accommodate the operations in the tiers above them, guided largely by sophisticated Spectrum Access Systems that determine and communicate spectrum availability. This framework enabled the CBRS auction to attract a great variety of participants and winners, such as education and health care providers, wireless internet service providers, utilities, Tribes, and equipment manufacturers, in addition to more traditional broadband internet service providers. The auction involved 271 qualified bidders and resulted in

228 unique winning bidders⁶—*ten times more winning bidders than in the 3.45 GHz band licensed-exclusive auction*, held less than a year later. Even entities with uses or businesses that could not support participation in the auction may seek GAA use and, therefore, have an opportunity to innovate in the band. Moreover, the FCC introduced these commercial operations without the massive delay, expense, or disruption of attempting to clear incumbent operations from the band—including important government users.

In just a short time, the CBRS band has demonstrated the real-world possibilities of a dynamic licensed-shared approach to spectrum management.⁷ The market for CBRS services and devices has been vibrant and growing, with over 300,000 CBRS base-station devices deployed—more than 60% of the *total* number of cell sites deployed by the commercial wireless industry in over forty years. Providers are using their PAL licenses to support 5G services—including in collaboration with municipalities—and other products for their customers. In addition, the CBRS band’s licensed-shared approach has also increased broadband access and overall connectivity in education, healthcare, agriculture, manufacturing, and the military. Examples include a partnership with the New York Public Library system to provide free broadband connectivity to underserved residents living near several libraries,⁸ a project providing thousands of rural students in the San Joaquin Valley with fixed wireless access,⁹ and

⁶ FCC, *Public Reporting System: Auction Data*, <https://auctiondata.fcc.gov/public/projects/auction105> (last visited Apr. 3, 2023).

⁷ Bidding concluded in the CBRS auction less than three years ago, and the first grants of PAL licenses occurred in March 2021. *See Wireless Telecommunications Bureau Grants Auction 105 Priority Access Licenses*, Public Notice, 36 FCC Rcd. 4926 (2021).

⁸ Press Release, Celona Inc., New York Public Library and Celona Partner to Shrink the Digital Divide (July 19, 2022), <https://www.celona.io/resources/celona-at-nypl>.

⁹ Press Release, Nokia, Nokia Delivers Private Wireless to Bridge the Digital Divide for Students’ Homes in Rural California (Feb. 8, 2022), <https://www.nokia.com/about->

a first-of-its-kind private network for an extensive Internet of Things (“IoT”) automation program at the Marine Corps Logistics Base in Albany, Georgia.¹⁰ Importantly, CBRS private networks are particularly well suited to IoT device applications, with more protections and lower latency than is typically possible in unlicensed spectrum.

Licensed-exclusive advocates claim—with no persuasive support—that shared licensing stifles innovation and discourages investment. But their arguments typically consider only investments that align with the major carriers’ business plans and high-site, high-power networks. Other users—like new competitors, smaller businesses, and companies interested in innovations like localized private LTE or 5G networks—are dismissed or ignored. These arguments also typically assume away the problem of disruption to incumbent users, including federal operations. Licensed-exclusive advocates’ explicit or implicit answer often is that those existing users should be forced to find other spectrum or limit their operations to be consistent with the biggest mobile carriers’ preferences. That represents a self-serving, one-sided approach—not a spectrum strategy. And it is not a sustainable approach to spectrum policy in the short, medium, or long term.

In **Question 3**, NTIA asks which spectrum bands should be included in the pipeline for licensed-shared use. The 3.1 GHz band is especially well suited to replicate the success of the CBRS band through a lower-power, licensed-shared framework. It also represents a key swath of mid-band spectrum that is critical for the deployment of 5G and other innovative services.

us/news/releases/2022/02/08/nokia-delivers-private-wireless-to-bridge-the-digital-divide-for-students-homes-in-rural-california/.

¹⁰ Iyad Tarazi, *Bringing Private 5G to Life Via the DOD’s 5G-to-Next G Initiative*, Federated Wireless (Feb. 17, 2021), <https://www.federatedwireless.com/blog/bringing-private-5g-to-life/>.

Licensed-shared spectrum in the 3.1 GHz band will promote competition by making spectrum available to diverse users and use cases, including NCTA members who will use that spectrum to continue to build their own competitive wireless networks. Competitive providers, private enterprise users, and even nationwide carriers can benefit from licensed-shared spectrum—Verizon, for example, was one of the biggest winners of PALs in the CBRS auction.

A licensed-shared approach is also the best option for deploying the 3.1 GHz band quickly, and in a manner consistent with important federal equities. NTIA, DoD, and other stakeholders are already conducting research and development to determine how best to share this band and expand services for consumers, while protecting mission-critical national security operations. Because this work is well underway, NTIA should not inadvertently slow this process by identifying the band for “study.”¹¹ In fact, since the period of study is already nearing an end, the spectrum pipeline should designate the 3.1 GHz band as ready for action as a licensed-shared band.

The 12.7 GHz band also holds potential for a simple sharing framework that would permit new mobile and fixed operators to share spectrum with incumbents. As such, the pipeline should identify the 12.7 GHz band for future study, using a CBRS-like framework. Although the 12.7 GHz band offers less utility and does not represent the same level of priority for action as the 3.1 GHz band, there is value in undertaking the work now to prepare for more intensive use of this band.

¹¹ *Request for Comments* at 16246 ¶ 8.

C. NTIA should include unlicensed bands in the spectrum pipeline.

The *Request for Comments* recognizes that the spectrum pipeline must identify unlicensed spectrum bands alongside licensed-exclusive and licensed-shared bands. Unlicensed bands now carry much more traffic than all licensed-exclusive bands combined, including more than 80% of mobile traffic on average, industrywide¹²; accordingly, it is vital for the Spectrum Strategy to identify additional specific unlicensed bands to meet American consumers and industry’s short- and long-term connectivity needs. NCTA encourages NTIA to include unlicensed spectrum in the pipeline—beginning with the 7 GHz band, which is the next critical opportunity to efficiently expand unlicensed growth and innovation.

Wi-Fi is an essential part of broadband delivery and our everyday lives. As the FCC has explained, “[u]nlicensed devices that employ Wi-Fi and other unlicensed standards have become indispensable for providing low-cost wireless connectivity in countless products used by American consumers.”¹³ For many, Wi-Fi is synonymous with internet access—80% of data traffic consumed on mobile phones uses Wi-Fi rather than a licensed technology, and an increasing majority of *all* global fixed and mobile internet traffic relies on Wi-Fi. Across Comcast households, for example, nearly a billion devices connected to Wi-Fi in 2021, representing a 12x increase since 2018; for Charter, nearly 500 million devices are connected to Wi-Fi today.

¹² See, e.g., Christopher Szymanski, *#20yearsofwifi with Broadcom*, The Beacon & Wi-Fi Alliance (Aug. 28, 2019), <https://www.wi-fi.org/beacon/christopher-szymanski/20yearsofwifi-with-broadcom>; Mike Dano, *A Closer Look at How Cable Can Profit in Mobile*, Light Reading (Jan. 4, 2023), <https://www.lightreading.com/cable-tech/a-closer-look-at-how-cable-can-profit-in-mobile/d/d-id/782545>.

¹³ Press Release, FCC, FCC Adopts New Rules for the 6 GHz Band, Unleashing 1,200 Megahertz of Spectrum for Unlicensed Use (Apr. 23, 2020), <https://www.fcc.gov/document/fcc-opens-6-ghz-band-wi-fi-and-other-unlicensed-uses>.

Although Wi-Fi 6 reached 50% market adoption more rapidly than previous Wi-Fi generations, data-intensive and latency-sensitive wireless applications—including remote education and connected devices in the classroom, telemedicine, augmented, virtual and mixed reality (“AR,” “VR,” and “XR”), and telework—need greater capacity, higher throughput, and lower latency than ever before. To meet the needs of American consumers and businesses, innovators require additional Wi-Fi spectrum and access to wider channels. Specifically, the next generation of Wi-Fi—Wi-Fi 7—is standardizing 320 MHz-wide channels to support a higher number of devices, 10 Gbps and faster speeds, and greater capacity to power the telemedicine, digital learning, telework, and AR, VR, and XR applications that American consumers and businesses increasingly need and demand.

To keep up with skyrocketing demand for unlicensed spectrum, the United States made the 6 GHz band available for unlicensed sharing with incumbents in 2020. As the first unlicensed designation of mid-band spectrum in more than a decade, unlicensed access to the 6 GHz band was badly needed to address pent-up demand. It also enabled, for the first time, 160 MHz-wide channels that allow for multi-gigabit Wi-Fi speeds: an important step toward the 320 MHz-wide channels being developed for Wi-Fi 7 and future generations. Furthermore, unlike licensed-exclusive bands, the 6 GHz band is heavily encumbered. The FCC’s rules allow use of the full band only for low-power, fixed indoor use, limited to at most a quarter the power of standard Wi-Fi. Unlicensed fixed outdoor use and standard-power use, even indoors, will be possible in the 6 GHz band after the FCC approves the pending applications for Automated Frequency Coordination (“AFC”) system operators, which will determine the channels and power levels that can be used without presenting a risk of harmful interference to incumbent fixed microwave receivers. As a result, even when the FCC makes 6 GHz unlicensed fixed

standard-power and outdoor operations possible, the rules to protect incumbents will block Wi-Fi in many areas. Therefore, unlicensed access to the 6 GHz band represents an important advancement, but it is just one of many necessary steps toward meeting the Nation's unlicensed needs. NTIA's spectrum pipeline should identify specific new bands for unlicensed use to ensure that the Spectrum Strategy accounts for the single most important wireless technology for American consumers and businesses, and maintain the United States' leadership in Wi-Fi-powered connectivity and innovation.

This is particularly important for the next generations of Wi-Fi: Wi-Fi 7 and Wi-Fi 8. These fast-approaching technologies will provide Americans with even more capacity, better throughput, lower latency, superior spectral efficiency, and enhanced security. They also depend on additional wide channels to enable full multi-gigabit Wi-Fi to match the multi-gigabit wired broadband in which NCTA's members continue to heavily invest. The FCC recognized the importance of wide channels, such as 160 megahertz channels, in the 6 GHz proceeding. But Wi-Fi 7's and Wi-Fi 8's higher capacity, lower latency, and improved energy efficiency through even wider channels—320 megahertz—are even more important. The 6 GHz band currently supports seven 160-megahertz channels and three 320-megahertz channels for low-power indoor use, and even fewer for fixed outdoor, standard-power use when such operations are ultimately authorized. Additional 320-megahertz channels are critical in the near future as consumers increasingly demand, and more devices require, high speed, high capacity Wi-Fi connectivity.

In response to **Question 3**, the 7 GHz band—adjacent to the 6 GHz band—is the best near-term opportunity to keep pace with the constantly-growing demand for Wi-Fi and unlicensed spectrum. Because it is adjacent to the top of the 6 GHz band, expanding unlicensed use into the bottom of the 7 GHz band would be an extremely efficient and effective use of the

band. The spectrum pipeline should immediately identify the bottom part of the 7 GHz band for expedited action, and NTIA can act quickly since it has been studying the 7 GHz band since 2019. The incumbent environment in the lower 7 GHz band includes government-fixed microwave links, similar to the commercial operations in the 6 GHz band. This means that the incumbent-protection approaches the FCC has already adopted for the 6 GHz band—low-power indoor use and standard-power use under Automated Frequency Coordination control—can be applied to the lower 7 GHz band. Introducing licensed-exclusive use, by contrast, likely would require incumbent 7 GHz systems to relocate, leading to the loss of government operations, enormous costs, and great delay.

The spectrum pipeline should also identify the remainder of the 7 GHz band for study, with a focus on unlicensed and other sharing solutions. The upper portions of the 7 GHz band present a different incumbent environment, much of which is allocated for federal operations. Evaluating low-powered unlicensed and other shared scenarios in this part of the band would be an effective way for the U.S. government to commercialize spectrum without requiring federal operations to relocate.

D. NTIA should evaluate the need for additional licensed-exclusive spectrum.

NCTA member companies rely on licensed-exclusive spectrum, both as licensees and as mobile virtual network operators. The spectrum pipeline should include studies of the following bands that CTIA, which represents all of the nationwide carriers, has identified for exclusive licensing: 1.3 GHz, 1.7 GHz, and 4.4-4.9 GHz.¹⁴

¹⁴ See CTIA, *A National Spectrum Strategy to Lead in 5G*, 6, <https://api.ctia.org/wp-content/uploads/2019/04/A-National-Spectrum-Strategy-to-Lead-in-5G.pdf>; see also Accenture, *Spectrum Allocation in the United States*, 36 (2022), <https://api.ctia.org/wp->

The United States has identified numerous bands and conducted dozens of auctions for licensed-exclusive use. These auctions span low-band, mid-band, and high-band frequencies, and provide companies with licensed-exclusive networks and a wide and robust array of spectrum options. In order to properly consider the need for additional licensed-exclusive bands, it is important for NTIA to consider the full range of bands already available for licensed-exclusive use.

In recent years, proponents of more licensed-exclusive spectrum have insisted that they must have access to low-band, mid-band, and high-band frequencies, arguing when convenient that their access to each of these spectrum ranges was critical. This approach worked. In the low-band, auctions occurred in the 600 MHz, 800 MHz, and 900 MHz bands. In high-band frequencies, proponents of licensed-exclusive spectrum argued for and won auctions in the 24 GHz band, the 28 GHz band, and the upper 37 GHz, 39 GHz, and 47 GHz bands. And in the mid-band, they argued for and won exclusive auctions in 2.5 GHz, 3.45 GHz, and 3.7 GHz bands. As a result of all these auctions, as discussed above, the FCC has found that just three companies control the vast majority of the Nation’s licensed-exclusive spectrum resources—78%, according to the FCC’s recent Communications Marketplace Report.¹⁵

Proponents of licensed-exclusive spectrum now attempt to convince policymakers that only a narrow and carefully defined “mid band” is relevant to the Nation’s Spectrum Strategy. In doing so, they have argued, misleadingly, that there is “7x more spectrum” available for

content/uploads/2022/09/Spectrum-Allocation-in-the-United-States-2022.09.pdf (“Accenture Report”).

¹⁵ See *Communications Marketplace Report*, 2022 Communications Marketplace Report, FCC No. 22-103, GN Docket No. 22-203, ¶ 86 (rel. Dec. 30, 2022).

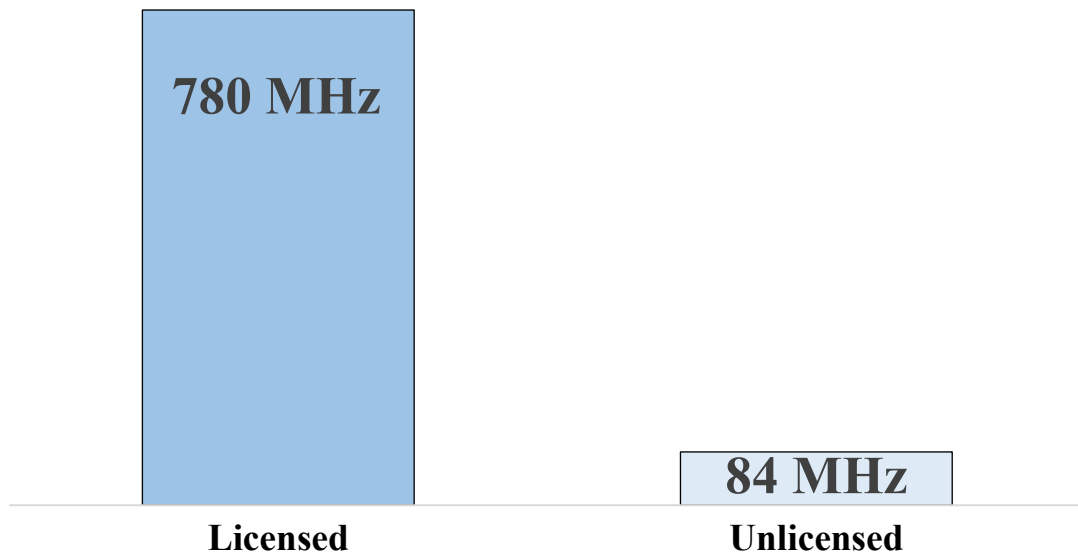
unlicensed use “in the mid-band” than for licensed use.¹⁶ This inapt comparison excludes the majority of nationwide carriers’ licensed-exclusive spectrum, incorrectly accounts for spectrum in the mid band, and ignores fundamental differences between licensed and unlicensed spectrum that make a megahertz-to-megahertz comparison inappropriate.

First, the comparison ignores the majority of nationwide carriers’ spectrum holdings by excluding low-band spectrum, as defined by licensed-exclusive proponents. Any analysis of spectrum holdings and availability must include these bands, which are at the core of mobile networks. As licensed-exclusive advocates note, a key reason that federal policy should support licensed-exclusive networks is that they are particularly well suited for mobile coverage of wide areas. Low-band spectrum possesses the physical characteristics that best match this goal, and cellular network providers worked hard to convince Congress, NTIA, and the FCC to identify, auction, and assign spectrum in critical low bands. Today, cellular networks depend heavily on these bands throughout the country, and it would be inappropriate to ignore them in analyzing relative spectrum holdings. The following graph (which, based on licensed-exclusive proponents’ position, includes the 2.5 GHz band) shows why it is so important to consider low-band spectrum in any analysis—*there is 9x more licensed-exclusive spectrum than unlicensed spectrum below 3 GHz*.¹⁷

¹⁶ Accenture Report at 2.

¹⁷ Analysys Mason, *Comparison of Total Mobile Spectrum in Different Markets*, 6 (Sept. 2022), <https://api.ctia.org/wp-content/uploads/2022/09/Comparison-of-total-mobile-spectrum-14-09-22.pdf> (“Analysys Mason 2022 Report”).

Spectrum Below 3 GHz



Second, licensed-exclusive proponents' comparison depends on an incorrect accounting of mid-band spectrum. The comparison inexplicably excludes from the number of licensed-exclusive megahertz the spectrum already set for licensed use in the C-band once incumbents are cleared, by the end of 2023. The licensed-exclusive proponents also exclude the 2.5 GHz band from their version of the mid-band, even though they advocated for this band to be auctioned, the largest carriers won the majority of licenses in that auction, and the FCC designated 2.5 GHz as part of the mid-band.

Third, and most fundamentally, the licensed-exclusive proponents' comparison ignores the fact that licensed and unlicensed spectrum bands are subject to different rules and significant operational limitations that any megahertz-to-megahertz comparison is inappropriate. Auctions of exclusive spectrum grant a single company the right to use frequencies in a particular area and to exclude all other users. Unlicensed bands require sharing among many thousands of users in the same geographic area, while prioritizing and avoiding interference to incumbent users, and

without the harmful-interference protections that are guaranteed to licensed spectrum holders. Any comparison that does not account for this central difference, and asserts that a megahertz of licensed-exclusive spectrum is the same as a megahertz of unlicensed spectrum, is fatally flawed.

Additionally, proponents of licensed-exclusive bands advocate for clearing those bands of incumbents so that the large carriers can operate without significant encumbrances.

Unlicensed bands like the 6 GHz band are vastly different, and operations are subject to strict rules that heavily encumber the spectrum. These encumbrances include indoor-only rules, far lower powers than in licensed bands, and geographic use restrictions such as those imposed by Automated Frequency Coordination. Nonetheless, the licensed-exclusive proponents’ narrative ignores these differences and inappropriately compares unencumbered licensed spectrum with encumbered unlicensed spectrum. Accounting for this difference when comparing licensed to unlicensed spectrum produces a far different result:

	Licensed	Unlicensed
Unencumbered	1,160 megahertz ¹⁸	208.5 megahertz ¹⁹
Encumbered	70 megahertz ²⁰	1,780 megahertz ²¹

¹⁸ Based on Analysys Mason 2022 description of 780 megahertz as “low-band,” plus 3.7 GHz band and 3.45 GHz band. *See* Analysys Mason 2022 Report at 6.

¹⁹ 2.4 GHz unlicensed and U-NII-3.

²⁰ Treating the CBRS band as “encumbered” for licensed purposes, compared to high-site, high-power bands.

²¹ Encumbrances include indoor restrictions, power limits, a requirement to use Dynamic Frequency Selection, and satellite protections, in U-NII-1, U-NII-2a, U-NII-2c, general authorized access (licensed by rule) in the 3.5 GHz band, U-NII-4 in 5.9 GHz band, and U-NII-5 through U-NII-8 in the 6 GHz band.

The licensed-exclusive advocates’ “megahertz to megahertz” comparison also ignores that unlicensed spectrum carries much more traffic than licensed bands. In 2019, for example, Cisco’s Visual Networking Index projected that in 2022, 51% of all data traffic (wired or wireless) would be carried over Wi-Fi, and only 19.6% of traffic would travel over mobile networks not including Wi-Fi.²² The unreliable “megahertz-to-megahertz” comparison between exclusive-licensed and unlicensed spectrum ignores the fact that unlicensed spectrum is available to and used by all wireless providers including, in large part, by the nationwide cellular carriers. Allowing more unlicensed shared access, therefore, promotes access and competition among all providers, and does not advantage one provider over another. The National Spectrum Strategy must therefore account for the fact that while both licensed and unlicensed bands are critical, Americans rely on unlicensed spectrum substantially more than they rely on licensed bands. The Nation’s spectrum pipeline must include licensed bands, but failing to identify new unlicensed bands would undermine rather than advance NTIA’s goals.

PILLAR 2 – NTIA’S LONG-TERM SPECTRUM PLANNING PROCESS

NCTA agrees with NTIA that the National Spectrum Strategy should create a platform for a “long-term strategic spectrum planning process.”²³ The wireless landscape changes rapidly, with new technologies, changing consumer and industry requirements, and ever-evolving networks. This dynamism makes future planning challenging. To create a structure that supports planning while accounting for this dynamism, NCTA recommends the following:

²² Cisco, *Cisco Visual Networking Index: Global Mobile Data Traffic Forecast Update, 2017-2022*, 20 & fig.20 (Feb. 2019).

²³ *Request for Comments* at 16246.

First, long-term planning should focus on creating a spectral environment that encourages rather than undermines innovation, economic growth, and strong government systems. In analyzing future spectrum use and needs, NTIA should not make recommendations based solely on past models of predominant spectrum use. Such assumptions risk ignoring the enormous growth and reliance on technologies like Wi-Fi and limiting creative and innovative spectrum-use and spectrum-sharing techniques. Moreover, assumptions based too heavily on the technologies and business models of today's incumbent wireless providers that control large swaths of licensed spectrum also run a significant risk of implicitly or explicitly favoring those companies moving into the future. The Nation's spectrum policy should create a launchpad for success, competition, and innovation, rather than only preserve the status quo.

Second, long-term planning and priority-setting should involve a wide variety of stakeholders. The FCC already plays a central role in long-term planning, both for licensed and unlicensed spectrum, and it must continue to do so, including in any new process created as part of the National Spectrum Strategy, while also retaining its role as the expert technical agency for commercial spectrum access. Beyond the FCC's role, the process should include a variety of perspectives on spectrum allocation and use, including licensed-exclusive, licensed-shared, and unlicensed networks. Different stakeholders will have different perspectives on what "optimiz[ing] the effectiveness of U.S. spectrum allocations" means, and how to accomplish it.²⁴ The earlier NTIA can begin to encourage those views and incorporate them into its decision making, the better.

²⁴ *Id.* at 16247 ¶ 6.

Third, long-term planning must facilitate productive conversations between federal and non-federal stakeholders. The Partnering to Advance Trusted and Holistic Spectrum Solutions (“PATHSS”) task group, which brings DoD into conversation with commercial stakeholders of all views, is a step in the right direction, and those conversations will be increasingly important when considering spectrum allocation and use in other bands. The PATHSS process has brought key players together and has facilitated important information sharing. Direct and open exchanges like those in PATHSS are far superior to a system in which government agencies or commercial interests ignore, or potentially conflict with, one another.

Fourth, long-term planning must consider how to advance U.S. policies and technology leadership internationally. Given the impact of our actions—and those of our allies and adversaries—on global spectrum issues and broader technological, economic, and even national security developments, U.S. spectrum policy cannot end at the border. The planning process should include the development of long-term strategies for U.S. leadership in multilateral settings like the International Telecommunication Union and international standards-setting organizations. It should also include the development of effective U.S. government support for U.S. policy and interests in bilateral contexts. The federal government should make it a priority to work directly with countries around the world to adopt similar spectrum policies to ours.

Those multilateral and bilateral steps are particularly important in the unlicensed context. Wi-Fi is led by U.S. companies and is at the heart of U.S. technology leadership. Wi-Fi was born in the United States, and the leading companies building Wi-Fi chips and equipment are based in the United States. Other countries typically follow the United States when it comes to permitting unlicensed (also called “license-exempt”) spectrum use. But not all countries support this approach: China consistently opposes international efforts to study bands for license-exempt

use, pushing instead for licensed-exclusive international mobile telecommunications designations. Long-term planning should include processes to support critical U.S. leadership through spectrum policy. This is also important in the short term, as the United States should support the designation of the full 6 GHz band for unlicensed operations to support U.S. companies.

PILLAR 3 – PROMOTING TECHNOLOGY DEVELOPMENT

NTIA correctly recognizes that the National Spectrum Strategy not only should use all of the tools currently at our disposal, but also should work to develop new tools. Identifying a spectrum pipeline and developing a long-term planning process will not be sufficient to meet the needs of the future without investment in developing new ways to use and share spectrum.

Key among the innovations that will allow the United States “unprecedented spectrum access”²⁵—and maintain the United States’ international role as a spectrum leader—are spectrum-sharing tools. Recent innovations in spectrum sharing have already been extremely successful in opening new bands to more intense and efficient use.

In the CBRS band, for example, Spectrum Access Systems sense incumbents’ use of the band using the Environmental Sensing Capability and maintain a database of CBRS devices, dynamically making spectrum-availability assignments to maximize use of the band. That sharing approach relies on technologies that were not readily available in previous decades: in particular, a sophisticated system of sensors to detect federal frequency use, storage and computing power to determine spectrum availability, and communications standards and equipment to receive those assignments and use the spectrum accordingly. Similarly, in the

²⁵ *Id.* at 16247.

6 GHz band, multiple industries have invested significant time and resources into developing Automated Frequency Coordination systems that can apply complex propagation models for numerous devices in an enormous number of locations to make standard-power unlicensed operations available while protecting incumbent microwave receivers from harmful interference. Even comparatively simple sharing via the FCC's rules for low-power indoor unlicensed use of the 6 GHz band involves significant technical expertise, and has created enormous value for consumers who can now benefit from technologies like Wi-Fi 6E and Wi-Fi 7.

We should work together to build on these successes. For example, the Incumbent Informing Capability is a promising new development that could improve on the Environmental Sensing Capability by allowing Spectrum Access System operators and users to rely on government notifications in near real-time. If implemented effectively, it could help reduce both false positives of government use and overbroad preemption of spectrum availability.

The National Spectrum Strategy should support investment in these and other technologies for permitting new uses to coexist with incumbent federal and non-federal users. We should be optimistic about what the wireless landscape may be five, ten, or twenty years from now and ensure that the strategy includes sufficient flexibility to foster a diverse set of users and technologies. To prepare for an evolving wireless environment, the Spectrum Strategy should recognize that the Nation will need a diverse set of spectrum-sharing tools to make the most of increasingly scarce spectrum. Fortunately, the United States is currently the world leader in spectrum sharing. But maintaining that leadership position and using these tools to open bands that would otherwise remain closed to new services will take work. The Strategy should support existing spectrum-sharing approaches and develop additional tools in new shared bands.

CONCLUSION

NCTA applauds NTIA's vision and hard work in developing a National Spectrum Strategy and appreciates the opportunity to comment. A successful National Spectrum Strategy will require an approach that promotes licensed-exclusive, licensed-shared, and unlicensed spectrum. It must also recognize how American consumers and industries are connecting today, and assess the costs and complexities of clearing federal and commercial incumbents from scarce spectrum resources.

In implementing the Strategy, NTIA should prioritize the items in the spectrum pipeline that are best positioned for near-term action: the 3.1 GHz band already in study for licensed-shared access, and the lower 7 GHz band for unlicensed access.

Respectfully submitted,

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