

**DEPARTMENT OF COMMERCE
NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION**

Development of a National
Spectrum Strategy

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COMMENTS OF CHARTER COMMUNICATIONS, INC.

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INTRODUCTION AND SUMMARY

Charter Communications, Inc. (“Charter”) strongly agrees with NTIA that a National Spectrum Strategy and pipeline are essential for the United States to ensure an ongoing supply of spectrum to meet the constantly growing connectivity needs of American consumers, government agencies, schools, manufacturers, farmers, healthcare providers, and financial institutions. Meeting these connectivity needs is vital to maintaining our country’s leadership globally and to advancing national security, public safety, economic growth, innovation, and competition. As American innovators strive to keep pace with connectivity demands, and as federal users continue to rely on vital frequencies to power our national defense and other critical operations, U.S. spectrum resources are becoming increasingly scarce. The solution to this scarcity lies in shared spectrum models, such as unlicensed Wi-Fi and licensed models of dynamic spectrum sharing, which are delivering tailored wireless services to meet the country’s growing spectrum needs.

Wi-Fi and unlicensed spectrum – which led the Internet of Things (“IoT”) revolution – adds about a trillion dollars to the U.S. economy annually, with projections for its economic contributions to reach \$1.58 trillion by 2025.¹ More than an astounding 80 percent of the data traffic consumed on mobile devices industrywide is carried over unlicensed Wi-Fi spectrum. Similarly, the Federal Communications Commission’s (“FCC”) recent auction of lower-power shared CBRS licenses democratized spectrum ownership by prompting the largest number of auction participants in history – with 228 winning bidders, which is ten times more than participated in the 3.45-3.55 GHz auction for a smaller amount of auctioned spectrum. The diverse participant group included municipalities, schools, factories, ports, agricultural entities, rural

¹ See Wi-Fi Alliance, *Global Economic Value of Wi-Fi, 2021-2025* (Sept. 2021) (“Global Economic Value of Wi-Fi”).

wireless internet service providers, new entrants from the telecom sector such as Charter, as well as the traditional large wireless providers.² Many of these entities are already using those licenses and General Authorized Access (“GAA”) to deliver innovative 5G services, including to improve the efficiency of supply chains, warehouses, and seaports, to enhance worker safety and productivity, to increase efficiencies and cost savings through precision agriculture, and to close the digital divide and homework gap for underserved communities.

To ensure continued efficient and highly effective uses of critical scarce spectrum, our National Spectrum Strategy should encompass the unlicensed and shared-licensed access models that align with how Americans are connecting and delivering services today. In addition to facilitating the efficient and widespread use of spectrum by a wide range of diverse commercial and government users, these innovative spectrum sharing models do not incur the substantial costs, delays, and burdens for government and other critical incumbent operators to clear spectrum for just a very few exclusive licensees. Spectrum sharing also enables a range of competing business models to meet an entity’s wireless needs, rather than forcing all industries to rely on off-the-shelf services offered by a small number of providers at a “take it or leave it” price.

Charter has a strong interest in the future of spectrum policy. The company is delivering its connectivity services to 32 million customers across 41 states and is one of the fastest-growing mobile service providers with more than 5 million customer lines for its Spectrum Mobile branded services launched only a few years ago. Spectrum Mobile is currently provided by Charter through a Mobile Virtual Network Operator (“MVNO”) arrangement, which leverages our robust and long-

² See *Auction of Priority Access Licenses in the 3550-3650 MHz Band Closes; Winning Bidders Announced for Auction 105*, Public Notice, 35 FCC Rcd 9287 (2020).

standing Wi-Fi network and extends its reach so that our customers can efficiently and cost-effectively connect whenever and wherever they need high-quality, high-speed services.

Charter's broadband network infrastructure currently passes 55 million (and growing) homes and businesses, with over 800,000 miles of network infrastructure. With nearly 500 million IP devices connected to our network, and 85% of the mobile data traffic going over Wi-Fi, which we expect to increase as the numbers of connections and connected IoT devices grow, Charter is constantly investing and innovating in our products and services to stay ahead of consumer demands. We are working to cost-effectively deliver high-capacity, high-compute, low-latency connectivity throughout our footprint, and increase wireless competition, by efficiently integrating multiple access technologies like unlicensed Wi-Fi, shared CBRS and other 5G spectrum, and converged and virtualized network technologies into a "hybrid mobile network."

Access to spectrum is key to enabling new wireless entrants to continue to innovate, compete, and keep pace with growing consumer demands. We agree with NTIA that identifying spectrum bands that can be used to meet future commercial and government needs is critical, and we believe that innovative shared spectrum models, like unlicensed and CBRS, are critical to promoting spectrum access and wireless competition. NTIA should leverage the FCC's strong expertise in spectrum policy decisions, and lessons learned from the successes of CBRS lower-power shared-licensing and unlicensed Wi-Fi sharing to multiply the benefits of enhanced wireless competition, innovation, and economic growth in the near term by applying them to the 3.1-3.45 GHz ("3.1 GHz"), 7.125-8.4 GHz ("7 GHz"), and 37-37.6 GHz ("Lower 37 GHz") bands. A National Spectrum Strategy that builds on these experiences by promoting a wide array of access models will ensure that the United States remains a global leader in wireless access and innovation for years to come.

I. CHARTER ENCOURAGES NTIA TO LEVERAGE SHARED-LICENSED AND UNLICENSED FRAMEWORKS AS IT DEVELOPS A NATIONAL SPECTRUM PIPELINE.

NTIA’s three pillars provide a useful framework upon which government, industry, and other stakeholders can collaborate to construct a balanced spectrum policy. For example, in **Question 1-3**, NTIA asks whether there are “spectrum access models (e.g., low-power unlicensed, dynamic sharing) that would expedite the timeline or streamline the process for repurposing the band?”³ In **Question 1-4**, NTIA asks how the National Spectrum Strategy should “assess efficient spectrum use and the potential for sharing.”⁴ In **Question 1-7**, NTIA asks about “the use cases, benefits, and hindrances of each of the following spectrum access approaches: exclusive-use licensing; predefined sharing (static or predefined sharing of locations, frequency, time); and dynamic sharing (real-time or near real-time access, often with secondary use rights)” and whether “previous efforts to facilitate sharing, whether statically or dynamically, [have] proven successful in promoting more intensive spectrum use while protecting incumbents.”⁵ NTIA also seeks input on a range of other issues related to shared-licensed and unlicensed spectrum models.⁶

³ *Development of a National Spectrum Strategy*, 88 Fed. Reg. 16244, 16246 (Mar. 16, 2023) (“Request for Comments”).

⁴ *Id.*

⁵ *Id.* In **Question 1-6**, NTIA also asks how to define “spectrum sharing.” *Id.* Charter supports NTIA’s proposed definition.

⁶ See **Question 1-8** (asking about “incentives or policies [that] may encourage or facilitate the pursuit of more robust federal and non-federal spectrum sharing arrangements”); **Question 2-3** (how stakeholders can “best engage in productive and ongoing dialogue regarding spectrum allocation and authorization, repurposing, sharing, and coordination”); **Question 3-1** (“[w]hat innovations and next-generation capabilities for spectrum management models (including both licensed and unlicensed) are being explored”); **Question 3-3** (seeking comment on which “spectrum management capabilities/tools would enable advanced modeling and more robust and quicker implementation of spectrum sharing”).

Shared-licensed and unlicensed sharing frameworks promote innovation and competition by lowering the barriers to entry for new entrants to compete and providing opportunities for specific industries to access and utilize spectrum to deliver services tailored specifically to a variety of needs and business models. As a result, lower-power shared-licensing, like CBRS, and unlicensed sharing are critical elements for the National Spectrum Strategy.

Shared-Licensed Spectrum. In the 3.5 GHz band, the FCC adopted the CBRS lower-power shared-licensed model – the result of close collaboration with NTIA, the Department of Defense (“DoD”), and industry – to allow DoD to continue critical operations while also allowing a wide variety of commercial operators to provide innovative and advanced wireless services, including 5G, in the same band. Under the adopted three-tiered spectrum sharing model, federal users retain priority access to the spectrum they need, while non-federal users are awarded individual licenses (“PALs”) and “licensed by rule” (“GAA”) access, with varying levels of interference protection, on an opportunistic basis managed by Spectrum Access System administrators. Lower power levels help facilitate sharing so that under this tiered framework, government-commercial sharing can effectively protect federal operations while permitting robust innovation that promotes competition, creating a virtuous cycle borne of spectrum sharing. Higher power levels would result in less efficient spectrum sharing.

Although still developing and growing, CBRS spectrum sharing in a short period of time has already demonstrated itself to be a resounding success that has enabled numerous new uses to enter the market and develop tailored services to meet industrial, manufacturing, educational, healthcare, and local government needs. Over 300,000 CBRS base station devices (“CBSDs”) have been deployed in just the three short years since CBRS was created. The FCC has also already certified nearly 200 different CBRS base station models and nearly 500 different end user

client devices. These CBRS deployments have also prompted expansive competition among new market entrants and traditional wireless service providers, and are maximizing the efficiency of critical mid-band 5G spectrum across the country, while thoroughly protecting military operations. The shared licensed model, lower power levels, and smaller geographic license sizes (county-size vs. traditional, large Partial Economic Areas) have empowered numerous new entrants to access and use these frequencies to develop and control their own private networks for industrial automation, manufacturing, artificial intelligence, and predictive maintenance, in environments ranging from warehouses, ports, factories, airports, and office buildings, in rural as well as densely populated areas, supporting supply chain efficiency.

For example, agricultural machinery and heavy equipment manufacturer John Deere uses CBRS in its factories to analyze data on welding patterns to create an algorithm for the best welds for future fabrications, and to improve operational efficiency by tracking equipment location and utilization in the factory. Without the CBRS licensing model, John Deere would have little choice but to rely on a legacy wireless carrier and its pricing to provide data analytics, and the service likely wouldn't be tailored to its specific needs as a result. CBRS provides it with "owner economics" and a competitive alternative.

Transportation and shipping hubs, like the Port of Long Beach, are using CBRS-based private networks to support automated-guided vehicles moving cargo and to improve real-time logistics through faster wireless communications, such as push-to-talk radios. Flexible CBRS licensing (*e.g.*, smaller geographic license sizes) and access rules have also allowed municipalities, schools, libraries, and hospitals to provide broadband access to more people in more places. In the FCC's CBRS auction, Charter invested \$465 million to win 210 CBRS Priority Access Licenses, which we are now integrating into our hybrid mobile network. For Charter, CBRS will

help to give us greater control and efficiency in how we deliver wireless services to our customers. Moreover, CBRS and the lower-power shared-license model is not only attractive to new mobile entrants like Charter, but even the largest wireless providers see its value. Verizon was the largest CBRS auction winner, spending \$1.9 billion to buy licenses. And Verizon is putting this spectrum to good use – the FCC’s recently released Communications Marketplace Report cited a report that Verizon’s median download speed when they use CBRS was over twice as fast as its non-CBRS download speed in one market.⁷

As demonstrated by CBRS’s success already, and likely for years to come, shared-licensed spectrum has widespread appeal to a variety of network operators and commercial investors and can stoke interest from both traditional and non-traditional market participants. The OnGo Alliance, an industry organization that supports the development, commercialization, and adoption of shared-licensed spectrum solutions like CBRS, estimates that the CBRS band alone will directly contribute as much as \$15.6 billion to the U.S. economy while unlocking tens of billions of dollars more in value to consumers.⁸

Significantly, the expansive economic growth, innovation and competition made possible by maximizing access to and the efficiency of this critical mid-band 5G spectrum has been achieved by safely sharing bandwidth with DoD without jeopardizing their critical national security mission or costing them exorbitant amounts to clear and replace equipment.

As we look forward to the deployment of other spectrum sharing and unlicensed spectrum models of access, Charter is participating in the Partnering to Advance Trusted and Holistic

⁷ *2022 Communications Marketplace Report*, GN Docket No. 22-203, FCC 22-103 ¶ 88 (2022).

⁸ See Press Release, OnGo Alliance, FCC Authorizes Full Commercial Deployment of OnGo™ Service in 3.5 GHz CBRS Band, Unleashing Billions in Value with New Wireless Services (Jan. 27, 2020), <https://ongoalliance.org/news/fcc-authorizes-full-commercial-deployment-of-ongo-service-in-3-5-ghz-cbrs-band-unleashing-billions-in-value-with-new-wireless-services/>.

Spectrum Solutions (“PATHSS”) Task Group with DoD, NTIA, the FCC, and other members of industry to exchange sensitive and classified information, analyze, and determine how new commercial services can co-exist with critical military operations in the 3.1-3.45 GHz band. This first-of-its kind collaboration has allowed industry and DoD, NTIA, and the FCC to share information and establish a mutual understanding of military and commercial needs, and has brought together technical experts from industry and the government to determine the best ways to facilitate commercial use of this critical spectrum while protecting existing and future military operations. We support the PATHSS process as a model going forward to allow the government and all of industry to work together collaboratively to find solutions to get the most out of every MHz of spectrum.

Unlicensed Spectrum. The availability of unlicensed spectrum plays an equally important role in promoting technological innovation, competition, and economic growth. 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.” As a result, Wi-Fi now contributes hundreds of billions of dollars annually to the U.S. economy: the Wi-Fi Alliance estimates that Wi-Fi contributed \$995 billion to the U.S. economy in 2021 alone, and that the global value of Wi-Fi will reach nearly \$5 trillion by 2025,⁹ and the Consumer Technology Association has estimated that Wi-Fi and other unlicensed wireless technologies together annually generate \$95.8 billion in incremental economic sales annually.¹⁰ This significant economic growth is all the more impressive when one considers that in its infancy spectrum bands making up unlicensed spectrum were originally referred to as “garbage bands” by

⁹ See Global Economic Value of Wi-Fi.

¹⁰ See Consumer Technology Association, *Unlicensed Spectrum and the U.S. Economy: Quantifying the Market Size and Diversity of Unlicensed Devices* (Jan. 2022).

government and industry alike. Today, the economic growth attributable to Wi-Fi dwarfs that of all other spectrum access models.

As mentioned above, today, unlicensed Wi-Fi supports more than 80 percent of the data traffic consumed on mobile devices industrywide, and 85 percent of mobile traffic for Charter customers specifically, which is more than all other wireless technologies combined. Unlicensed spectrum in combination with wireline backhaul is far more cost effective for consumers than licensed spectrum. In fact, consumers get at least 20 times more data for each dollar they spend on wireline and Wi-Fi service than they get for typical mobile wireless service plans. And, consumers' data traffic is projected to increase over the next decade as consumers and businesses rely more on IoT and other connected devices for more data intensive services, like virtual, augmented, and mixed reality. The next generations of Wi-Fi – beginning with Wi-Fi 7 – will utilize more bandwidth to support more devices and enable even faster speeds to power increasingly data-intensive applications like remote medicine, digital learning, immersive training, and more. Wi-Fi's increasing significance to American consumers and industries and the U.S. economy, as the true workhorse of wireless technologies, makes it a central component of the National Spectrum Strategy. Charter, therefore, urges NTIA to ensure that the national spectrum pipeline also reflects the growing demand and dependence on unlicensed spectrum to keep pace with technological advances, consumer demands, and to maintain U.S. leadership in unlicensed innovation.

II. THE 3.1 GHZ, 7 GHZ, AND LOWER 37 GHZ BANDS ARE CRITICAL NEAR-TERM OPPORTUNITIES TO EXPAND THE BENEFITS OF SHARED LICENSED AND UNLICENSED SPECTRUM.

Charter encourages NTIA to build on the successes of existing CBRS and advanced Wi-Fi services, and include as part of its National Spectrum Strategy shared-licensed and unlicensed models for the 3.1 GHz, 7 GHz, and Lower 37 GHz bands, which represent the most important

near-term spectrum opportunities.¹¹ As manager of the federal government’s spectrum resources, NTIA has a crucial role to play in balancing government and commercial spectrum needs to identify a pipeline, and establish the terms and conditions under which that spectrum can be put to its most efficient use.

3.1 GHz Band. Charter encourages NTIA to work together with its counterparts at the FCC and DoD to replicate the benefits of CBRS in 3.5 GHz by adopting a similar model for the 3.1 GHz band. A CBRS-like lower-power shared-licensing framework for 3.1 GHz presents a promising solution to commercializing highly valuable mid-band spectrum, while also ensuring robust protection of critically important DoD and other federal operations. DoD CIO, John Sherman, recently said that vacating the 3.1-3.45 GHz band is “untenable” for DoD, would cost hundreds of billions of dollars and decades to clear, and would cause significant mission impacts to the Joint Force’s warfighting readiness and capabilities.¹² The Assistant Secretary of Defense for Space Policy, John Plumb, has said it would cost at least \$120 billion just to start the process of clearing the band.¹³ Allowing access instead through a lower-power shared-licensing framework will avoid those costs and allow new wireless market entrants, like Charter, as well as manufacturers, schools and municipalities, and traditional wireless providers, to extend connectivity to more consumers, industries and communities of all sizes across the country.

¹¹ See Request for Comments at 16246 (seeking comment on bands to be studied over the short, medium, and long term).

¹² See Statement by John B. Sherman, Department of Defense Chief Information Officer, Before the House Armed Services Committee, Subcommittee on Cyber, Innovative Technology, and Information System, on “Defense in a Digital Era: Artificial Intelligence, Information Technology, and Securing the Department of Defense” at 11-12 (Mar. 9, 2023), <https://armedservices.house.gov/sites/republicans.armedservices.house.gov/files/Sherman%20Testimony.pdf>.

¹³ Jason Sherman, *Vacating mid-band for commercial 5G would cost DOD at least \$120 billion and take 20 years*, Inside Defense (Mar. 9, 2023), <https://insidedefense.com/daily-news/vacating-mid-band-commercial-5g-would-cost-dod-least-120-billion-and-take-20-years>.

7 GHz Band. Allowing unlicensed sharing of the 7 GHz band similarly presents an excellent opportunity to expand high-speed, high-capacity Wi-Fi, lay the foundation for Wi-Fi 7 and future generations, and promote further economic growth, without displacing or imposing significant costs and burdens on critical DoD and other federal incumbent operators currently using the band. Unlicensed sharing in the 7 GHz band is the optimal way to avoid disruption to critical federal operations, while meeting consumer and commercial spectrum needs, because unlicensed Wi-Fi and similar protocols are built to share and not cause interference. Allowing unlicensed sharing throughout the 7 GHz band would unleash critical Wi-Fi bandwidth to support the growing number of devices, faster Wi-Fi speeds, and greater capacity. Also, as wired networks become more and more powerful, more Wi-Fi is needed to fulfill the customer's full broadband connection potential and to ensure that there are no bottlenecks once the high capacity network reaches the home – especially given that 80% of traffic is delivered over Wi-Fi. Charter is seeing this first-hand as it is building out higher speed networks throughout America with fiber deployments and network upgrade evolutions that will provide consumers with a gig-symmetrical and 10 Gbps downstream network. Allocating more unlicensed spectrum in the 7 GHz band can power the future innovation of this world of converged high speed connectivity. And because 7 GHz is directly adjacent to the existing 6 GHz unlicensed band, extending unlicensed sharing into 7 GHz would create critical contiguous spectrum that unlicensed innovators could use to quickly enable next-generation, 320-MHz-wide channels (which are already being standardized internationally for Wi-Fi 7 and future Wi-Fi generations) to support even more devices at 10 Gbps and faster speeds to power data-intensive applications, like telemedicine, digital learning, immersive training, and other Augmented, Virtual and Mixed Reality (“AR,” “VR” and “XR”) applications. The FCC has already carefully crafted an unlicensed sharing framework in the 6 GHz band that

affords strong protections to important utility, public safety, and broadcast operations in the band, while allowing consumers access to multi-gigabit Wi-Fi. Extending the same framework to the 7 GHz band would be an efficient and cost-effective way to avoid relocating federal incumbents, ensure robust protections for federal systems, and also open this critical bandwidth to fuel faster, higher-capacity, and even more reliable next-generation Wi-Fi.

Lower 37 GHz Band. A database-enabled sharing regime in the Lower 37 GHz band would allow wireless carriers to expand multi-gigabit wireless connectivity while coexisting with federal operations. The FCC and NTIA have been reviewing this band for years, so it is well-positioned to quickly be made available for shared commercial and federal use. This band can provide the high-speed, low-latency services that are being developed for 5G and beyond. A simple licensing regime for the Lower 37 GHz band – modeled on the FCC’s approach in the 70/80/90 GHz bands¹⁴ – would allow commercial operators to use a database to coordinate multiple users, and enable licensed, non-exclusive use of the spectrum without many costly operational obligations. This type of licensing regime is well-suited for the Lower 37 GHz band because sharing in millimeter wave spectrum is simple, as signals do not travel far and operators generally must use highly directional antennas to deliver service. Charter has previously shared with NTIA staff studies that show how a simple sharing regime would promote more efficient spectrum use and greater benefits for consumers.

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¹⁴ See *Allocations and Service Rules for 71-76 GHz, 81-86 GHz and 92-95 GHz Bands*, WT Docket No. 02-146, Report and Order, 18 FCC Rcd 23318, 23322 ¶ 5 (2003); see also *Modernizing and Expanding Access to the 70/80/90 GHz Bands, et al.*, WT Docket No. 20-133, et al., Notice of Proposed Rulemaking and Order, 35 FCC Rcd 6039 (2020); *Wireless Telecommunications Bureau Seeks to Supplement the Record on 70/80/90 GHz Bands Notice of Proposed Rulemaking*, WT Docket No. 20-133, Public Notice, DA 21-1263 (WTB Oct. 8, 2021).

NTIA's development of a National Spectrum Strategy represents an exciting opportunity to spur competition and drive innovation while promoting key national interests. Charter appreciates the opportunity to comment on ways to ensure that NTIA's development of a spectrum pipeline keeps the United States at the forefront of wireless policy.

Respectfully submitted,

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