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Amazon.com, Inc. (Amazon) commends the work of the National Telecommunications and Information Administration (NTIA) to develop a National Spectrum Strategy. We agree that access to spectrum is essential for consumers and many issues of national importance, including innovation, economic growth, and national security. Given the demands for connectivity, the growth in wireless services and applications, and fierce global competition, identifying 1,500 megahertz of spectrum for potential repurposing to allow more intensive use is a reasonable starting point for NTIA to consider as it initially shapes a proactive National Spectrum Strategy. This goal is needed to maintain the United States' leadership in digital technologies and communications services. Critically, the National Spectrum Strategy must recognize the value of all wireless technologies and once developed, it should be regularly evaluated and updated to reflect our increasingly connected and wireless world.

At Amazon, almost everything we do for consumers is built on connectivity, including wireless technologies enabled by spectrum. We are committed to developing innovative wireless devices and services for consumers, and to enabling and expanding affordable connectivity. Amazon has a variety of spectrum use cases requiring access to unlicensed, shared, and licensed spectrum. For example:

- Amazon has committed more than \$10 billion to build the Kuiper System, a non-geostationary orbit, fixed-satellite service (NGSO FSS) that will operate in shared Ka-band spectrum.¹ In preparing to deploy the Kuiper System, Amazon is rapidly moving toward its goal of providing affordable, reliable, high-quality connectivity to customers and communities in the U.S. and around the world.
- We are building devices and services, like eero, that rely on and improve critical in-home connectivity, including Wi-Fi and other technologies,² which run over unlicensed spectrum in the 2.4 GHz, 5 GHz, and 6 GHz bands.
- We've rapidly built out Amazon Sidewalk, a long-range, low-bandwidth network for connected devices that now covers more than 90% of the U.S. population, using unlicensed spectrum in the 900 MHz band.
- Amazon relies on unlicensed spectrum in the 24 GHz and 60 GHz bands to enable new and innovative radar applications for our customers, including devices offering health and wellness and better functionality for customers with disabilities, and to enhance the safe operation of our drones.
- For enterprise customers, Amazon Web Services (AWS) launched its AWS Private 5G service using the Citizens Broadband Radio Service (CBRS) band and Integrated Private Wireless services on AWS by partnering with spectrum licensees. AWS also supports its wireless carrier customers through their transition to 5G and beyond using our cloud platform.

¹ The FCC authorized the Kuiper System in 2020. See *Kuiper Systems, LLC, Application for Authority to Deploy and Operate a Ka-band Non-Geostationary Satellite Orbit System*, Order and Authorization, 35 FCC Rcd 8324 (2020).

² See, *Local Connectivity Protocol Options for Smart Home Devices*, Amazon (Mar. 08, 2023), <https://developer.amazon.com/en-US/docs/alexa/smarthome/wwa-connection-options.html>.

These are just a few examples that demonstrate how access to spectrum is vital for Amazon to deliver for customers and why Amazon supports continued access to spectrum of all types—unlicensed, shared, and licensed. Striking the right balance will facilitate efficient ways to connect consumers, lower costs, and promote competition in the wireless market.

Spectrum Policy Principles. As NTIA develops a National Spectrum Strategy, Amazon urges NTIA to conduct its analysis using several key spectrum policy principles.

First, the National Spectrum Strategy plays an important role in existing efforts to close the digital divide. Strong commitments from both the public and private sector will ensure broadband connectivity reaches more people. It will take a variety of technologies to efficiently and effectively connect people everywhere. Broadly enabling technologies and different types of providers to access spectrum will best serve NTIA’s connectivity goals.

Second, maintaining U.S. leadership in multiple wireless technologies is important to our economic and national security. NTIA should therefore adopt a broad view that considers the spectrum needs of these technologies. In particular, technologies designed to coexist will promote multiple different use cases, laying the groundwork for innovation. Many connectivity technologies are complementary, requiring a holistic view as a national spectrum strategy is developed. For example, low Earth orbit (LEO) satellite solutions can provide backhaul for wireless providers to extend 5G networks into unserved and underserved areas, and mobile network operators can use unlicensed spectrum to offload traffic from cellular mobile devices.

Third, global harmonization of spectrum allocations, and the corresponding technical rules, across countries and regions benefits consumers. Harmonized spectrum reduces interference along borders, promotes interoperability of devices and equipment across markets, and ultimately lowers costs for consumers. It also fosters the success of U.S. technologies abroad, enabling devices and services developed here to be brought to customers around the globe.

Of particular importance is the international harmonization of the 6 GHz band allocated for unlicensed use. The Federal Communications Commission’s (FCC) decision to designate all 1,200 MHz in the 6 GHz band for unlicensed use was groundbreaking for the advancement of the Wi-Fi ecosystem.³ It paved the way for the newest and fastest generation of Wi-Fi, called Wi-Fi 6E, and eventually for Wi-Fi 7 and beyond. Many other countries have followed the United States’ lead. According to the Wi-Fi Alliance, 54 countries have designated all or part of the 6 GHz band for unlicensed uses like Wi-Fi.⁴ This is a positive step, but use of the band is still under consideration in countries around the world, and will be considered at the International Telecommunication Union (ITU) World Radiocommunication Conference (WRC-23) later this year.⁵ As the Dynamic Spectrum Alliance explained, the unlicensed use of this band internationally is crucial to cost-effectively bridging the digital divide, allowing for cost-savings from

³ See, *Unlicensed Use of the 6 GHz Band*, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd 3852 (2020).

⁴ *Countries Enabling Wi-Fi in 6 GHz (Wi-Fi 6E)*, Wi-Fi Alliance, <https://www.wi-fi.org/countries-enabling-wi-fi-in-6-ghz-wi-fi-6e> (last visited Apr. 6, 2023).

⁵ See, Resolution 1399 (WRC-23 Agenda Item 1.2), <https://www.itu.int/wrc-23/wrc-23-agenda/> (last visited April 12, 2023).

mobile offload, supporting both Wi-Fi 6E and 5G, and creating international interoperability in devices to the benefit of consumers and industry alike.⁶

Fourth, U.S. leadership at the ITU is critical to maintain American global leadership in wireless technologies. NTIA should equally prioritize access to unlicensed spectrum, particularly the 6 GHz band, as well as spectrum access for NGSO satellite systems internationally, including at the ITU. At the WRC-23 later this year, the U.S. needs to set forth key priorities to ensure that the rules for NGSO systems, and satellites generally, support the success of this U.S.-led technology and service.

Fifth, NTIA should leverage spectrum sharing to promote spectral efficiency and access, while protecting important federal users. Dynamic spectrum sharing technologies have opened new opportunities for a diverse set of users and applications, and enable multiple tiers of users. We have seen successes in the CBRS band, in which a cloud-based Spectrum Access System (SAS) coordinates sharing, and also in 6 GHz, where Automated Frequency Coordination (AFC) will govern sharing between incumbents and unlicensed users. Dynamic sharing creates win-win situations, and should continue to be explored in other bands moving forward.

Sixth, and finally, NTIA, in partnership with the FCC, should explore where existing rules and regulations could be modernized to create a more flexible and adaptive framework that enables innovation and emerging technologies. Simple updates to rules, such as increasing power levels for unlicensed devices or exploring frequency bands for new applications, could bring consumers additional features, experiences, and products with wide-ranging benefits. For example, as applied to Wi-Fi technologies, allowing unlicensed technologies to fully utilize the nominal power envelopes will improve the Wi-Fi options available to consumers. A National Spectrum Strategy should also explore ways to speed the existing waiver and rulemaking processes to bring benefits to consumers more quickly.

Role of the National Spectrum Strategy. In its request for comment, NTIA highlighted its proposal to identify at least 1,500 megahertz of spectrum for potential repurposing to meet current and future spectrum requirements of the U.S. economy. That is a worthy goal, and Amazon endorses it as a first step toward building a more comprehensive, evolving spectrum strategy for the U.S. Amazon's experience in spectrum technologies demonstrates, however, that the need to reassess the table of frequency allocations will be an ongoing issue as new technologies continue to surface and as demand continues to evolve, both for federal and non-federal users.

In addition to the issue of how to manage the allocation of spectrum between federal and non-federal users, Amazon also suggests that the National Spectrum Strategy take on two additional roles:

- (1) Support Global Harmonization: As a high-level policy matter, U.S. spectrum-based technologies should have a globally harmonized market opportunity advanced by decisions taken at the ITU Radiocommunication Bureau (ITU-R), and to achieve the goal of global harmonization should be supported by U.S. national delegation positions and buttressed by international spectrum allocations that work in tandem to support U.S. interests. An ITU-R policy statement in the National Spectrum Strategy is not intended to resolve every

⁶ *How to Realise the Full Potential of 6 GHz Spectrum*, Dynamic Spectrum Alliance and Policy Impact Partners, White Paper (2021), <https://dynamicspectrumalliance.org/wp-content/uploads/2021/02/6-GHz-White-Paper-EMEA-updated-February-2021.pdf>.

future debate within the context of developing U.S. positions for World Radio communication Conferences, but it is intended to create a high-level unifying policy objective that today does not exist elsewhere, and that can provide important guidance to U.S. stakeholders in the ITU-R process; and

- (2) Promote Efficient Use of Spectrum and Coexistence: NTIA should create specific, actionable objectives to foster coexistence, whether that is continuing to develop dynamic sharing technologies or improving our understanding of radio propagation to better resolve band adjacencies. For coexistence, as is discussed below, co-channel uses and adjacent channel impacts have already been established as the major themes of spectrum management going forward. A National Spectrum Strategy should promote improved and new capabilities to do more with spectrum.

Unlicensed Spectrum Is Critical for Innovation. Unlicensed spectrum underpins many of the technologies that American consumers and businesses, including Amazon, use and rely on every day. It also carries an overwhelming and growing majority of internet traffic.⁷ Amazon customers increasingly rely on unlicensed technologies, particularly indoors, to shop on Amazon.com and connect their Kindles, Echo devices, and Fire TVs. These technologies operate in 2.4 GHz, 5 GHz, and 6 GHz. Unlicensed spectrum is also the backbone of streaming at home, supporting Prime Video, Twitch, and Amazon Music. Many other devices and smart home innovations, including gesture recognition and health and wellness applications such as sleep monitoring or audio streaming to hearing aids and cochlear implants, are enabled by unlicensed spectrum.

The Wi-Fi Alliance estimates that the global value of Wi-Fi will reach nearly \$5 trillion by 2025 and at least \$1.58 trillion by 2025 in the U.S. alone.⁸ Unlicensed spectrum contributes to the 5G ecosystem, supporting mobile offload and saving consumers and companies significantly. Unlicensed spectrum needs are growing, many Amazon businesses and our customers will rely on the allocation of unlicensed spectrum keeping pace with this demand.

Current unlicensed allocations are not sufficient for future needs.⁹ The latest generation of Wi-Fi, called Wi-Fi 6E, requires 160 MHz channels to offer the fastest, lowest latency Wi-Fi available. However, the next generation of Wi-Fi is emerging in industry, Wi-Fi 7, and it will leverage larger 320 MHz channels to support billions of devices and applications. The 6 GHz band provides enough bandwidth for three

⁷ The Dynamic Spectrum Alliance report concluded in 2022 that for advanced economies, 90% of Internet traffic begins or ends on Wi-Fi. “How Europeans Connect to the Internet”, <https://www.dynamicspectrumalliance.org/wp-content/uploads/2022/06/DSA-WhitePaper-How-do-Europeans-connect-to-the-Internet.pdf>. In fact, economies around the world with strong deployment of fiber or advanced cable technologies report similar statistics. See also ACMA (Australia), “Communications and Media in Australia: How we use the Internet (2022)” (mobile data is a small fraction of total data) at <https://www.acma.gov.au/publications/2022-12/report/communications-and-media-australia-how-we-use-internet>

⁸ *Value of Wi-Fi*, Wi-Fi Alliance, <https://www.wi-fi.org/discover-wi-fi/value-of-wi-fi#:~:text=In%20addition%20to%20its%20well,grow%20to%20nearly%20%245%20trillion> (last visited Apr. 6, 2023).

⁹ See, *Unlicensed Spectrum*, Wi-Fi Alliance, <https://www.wi-fi.org/discover-wi-fi/unlicensed-spectrum> (last visited April 12, 2023).

channels, but Wi-Fi 7 is being designed for four 320 MHz channels. These channels are critical for high throughput applications and also help Wi-Fi systems manage dense deployments and even device power management. As demand increases for Internet of Things (IoT) devices, smart home devices, and drone applications, the need for more unlicensed spectrum will only grow. Amazon recommends that as NTIA develops the National Spectrum Strategy, NTIA explores with federal users whether the device classes introduced at the FCC as part of its 6 GHz proceeding could operate from 7125-7250 MHz.

Dynamic Sharing Access Enables New Innovative Users and Promotes Competition. Innovative and dynamic spectrum sharing models, such as the CBRS band in the U.S., enable efficient spectrum uses by a variety of stakeholders, including Amazon. CBRS enabled AWS to develop AWS Private 5G, a fully managed service that helps enterprises procure, deploy, and scale their own private 5G mobile network. Sharing models, particularly that of CBRS, lower the cost of entry for smaller players that would not typically participate in spectrum auctions. Experts estimate that the CBRS band and its shared uses of spectrum 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.¹⁰ The U.S. has led on the movement to private wireless networks with CBRS,¹¹ and the international community is now following our lead.¹²

While CBRS has been a significant success, it is not sufficient to meet the demand for more enterprise networks.¹³ In 2022, as a part of the Infrastructure Investment and Jobs Act (IIJA), Congress directed the Department of Defense and NTIA to study the lower 3 GHz band for potential commercial use. A dynamic sharing model in 3.1–3.45 GHz, similar to proven success of CBRS in the 3.5 GHz band, could maximize users and efficient use of limited mid-band spectrum. Spectrum sharing in this band could also bring this spectrum to market quickly and cost-effectively, and provide a viable alternative to relocating federal users in the band or requiring new devices or equipment for incumbents.

Should a spectrum strategy consider sharing between commercial users and federal operations in a band, NTIA should build on the demonstrated success of CBRS, which provides users with flexibility to choose from a wide range of technologies and service options to connect consumers while at the same time protecting important government users. In addition, a thoughtful discussion should be held on power levels in varied use cases to limit interference and ensure coexistence.

¹⁰ *The Potential Market Value and Consumer Surplus Value of The Citizens Broadband Radio Service (CBRS) at 3550-3700 MHz in the United States*, Harold Furchtgott-Roth (2017), https://ongoalliance.org/wp-content/uploads/2018/06/The-Potential-Market-Value-and-Consumer-Surplus-Value-of-CBRS-in-the-US_Whitepaper.pdf.

¹¹ See, *CBRS Leading a Global Trend of Private 5G*, CommunicationsDaily (April 13, 2023), https://communicationsdaily.com/article/view?BC=bc_64381fea9a170&search_id=665289&id=1566561 (“The U.S.’ citizens broadband radio service approach has been at forefront of a global movement for private 5G One key difference in the U.S. approach is that no other country has used a dynamic framework like the U.S. . . .”) (summarizing statements made by H-P’s head of global wireless policy); see also, *Why private 5G Networks are on the rise*, Hewlett Packard Enterprise (February 25, 2021), <https://www.hpe.com/us/en/insights/articles/why-private-5G-networks-are-on-the-rise-2102.html> (Describing the rapid growth of 5G private networks).

¹² See, Letter from Airspan Networks et. al. to Chairwoman Jessica Rosenworcel at 3 (Nov. 17 2022), <https://www.ala.org/advocacy/sites/ala.org.advocacy/files/content/telecom/broadband/CBRS%20Success%20Letter%20FINAL.pdf>.

¹³ See generally, John Leibovitz and Ruth Milkman, *Taking Stock of Spectrum Sharing* (Sept. 3, 2021), <https://ssrn.com/abstract=3916386> or <http://dx.doi.org/10.2139/ssrn.3916386>.

Licensed Spectrum Plays an Important Role in Many Wireless Technologies. Many existing and emerging wireless technologies also rely on licensed spectrum. Amazon is partnering with spectrum licensees to transform enterprise uses with the AWS Cloud. AWS Ground Station uses the S-band for space customers to control satellite communications, process data, and scale operations without their own ground station infrastructure. AWS works with communications service providers to deploy and support 5G networks, including leveraging AWS infrastructure and services to build the first standalone, cloud-based 5G Open Radio Access Network (O-RAN). AWS also helps carriers move functions to the edge for low latency applications.

A National Spectrum Strategy should examine and include licensed spectrum needs and opportunities for emerging technologies, including drone operations. Prime Air, Amazon’s drone delivery program, safely delivers packages weighing five pounds or less to customers in less than an hour using a fleet of all-electric drones. Prime Air recently launched deliveries to limited customers in Lockeford, California, and College Station, Texas, who have access to thousands of everyday items available for drone delivery, and will expand to additional locations in 2024 and beyond. Prime Air delivery drones leverage cellular networks, including in the 2 GHz, 4 GHz, and 12 GHz bands, but as drone operations like Prime Air grow, dedicated spectrum for drone operations, like in the 5030-5091 MHz band, could enhance operations by increasing safety and reliability. While unlicensed spectrum has an important role to play in drone operations, particularly with radar technologies to detect and avoid objects, dedicated licensed spectrum for safety critical capabilities, such as control and non-payload communication operations, will help enable drone operations to scale and maintain U.S. leadership in this technology.

Next-Generation Satellite Systems Call for Particular Emphasis and a Unique Spectrum Strategy.

Space-based systems represent a vital and growing sector of the nation’s communications and national security infrastructure. Indeed, just weeks ago, the White House’s National Science and Technology Council issued a report recognizing that “maintaining U.S. preeminence in space research is important as the use of Low Earth Orbit (LEO) grows and the development of space enters a new era.”¹⁴ For its part, the NTIA long-recognized the significance of next-generation space-based systems to the U.S. economy and national security—as well as the unique spectrum needs of such operations.¹⁵

Amazon is not alone in recognizing the importance and potential of next-generation satellite technology. There has been massive investment in recent years, particularly in NGSO FSS systems that plan to bring broadband and other innovative connectivity services to both public and government customers. According to Chairwoman Jessica Rosenworcel, the FCC has received applications for a reported 64,000 new satellites over the past two years alone.¹⁶ The U.S. has led the way for this growth, with U.S. firms

¹⁴ National Science and Technology Council, *National Low Earth Orbit Research and Development Strategy*, White House 1, 6 (March 2023), <https://www.whitehouse.gov/wp-content/uploads/2023/03/NATIONAL-LEO-RD-STRATEGY-033123.pdf>.

¹⁵ *The Spectrum Needs of U.S. Space-Based Operations: An Inventory of Current and Projected Uses*, NTIA (July 2021), https://ntia.gov/sites/default/files/publications/ntia_space-based_spectrum_report_0.pdf.

¹⁶ See, e.g., *Chairwoman Rosenworcel Announces Plan to Modernize the FCC by Establishing a Space Bureau and Office of International Affairs*, News Release (Nov. 3, 2022) (“The satellite industry is growing at a record pace Over the past two years the agency has received applications for 64,000 new satellites. In addition, we are seeing new commercial models, new players, and new technologies coming together to pioneer a wide-range of new satellite services and space-based activities that need access to wireless airwaves.”).

building nearly nine out of every 10 commercially produced satellites in 2021.¹⁷ As investment and deployment grow, so too will the need for additional spectrum to enable these new services.

NGSO FSS systems have particular importance to national security and to American leadership in space. The Department of Defense has repeatedly recognized the strategic importance of maintaining U.S. leadership in space-based capabilities.¹⁸ Other nations are not sitting back. China, for example, recently announced plans to operate its own 13,000-satellite broadband constellation.¹⁹

To maintain American leadership in the space economy, the National Spectrum Strategy must foster innovation and growth in the NGSO FSS systems that represent the future of the new space economy. Spectrum policies that serve only to protect incumbent technologies and systems will only stunt competition and delay the innovation that drives U.S. leadership. Amazon explains below how NTIA might develop spectrum policies that foster innovation and growth, while also accounting for the unique needs and characteristics of NGSO FSS systems.

NTIA should establish a spectrum pipeline to ensure U.S. leadership in next-generation satellite technology, one which must prioritize global harmonization and forward-looking satellite spectrum allocations. NGSO FSS systems are inherently global, and therefore, they uniquely require international harmonization in the process of identifying and allocating spectrum. American leadership in space requires not only the availability of spectrum for U.S. NGSO systems and those that have market access to the U.S., but also spectrum for those systems to operate globally. Amazon therefore strongly supports interagency cooperation between NTIA, the Department of State, the FCC, and other stakeholders to ensure a whole-of-government approach to fostering American leadership in next-generation satellite systems globally. Such efforts must include advocacy before the ITU, taking a stand against protectionism abroad, and other activities focused on ensuring that the U.S. blazes a trail in supporting innovative satellite services.

One vital aspect of this whole-of-government approach is ensuring that the U.S. not only keeps pace but leads in opening up new spectrum allocations for NGSO FSS systems. First and foremost, U.S. spectrum policy must allow U.S. operators to compete on an even plane in the global market. One example of this is in the 17 GHz band, where the FCC recently allocated additional geostationary orbit (GSO) FSS spectrum and recently proposed to allocate the same spectrum to NGSO FSS systems. In doing so, the FCC noted that such an allocation “would align with the preparatory studies for the ITU 2023 World

¹⁷ SIA, *State of the Satellite Industry Report 2022* at 22 (noting that “U.S. firms built about 87% of commercially procured satellites launched in 2021 and earned 54% of manufacturing revenues.”).

¹⁸ See, e.g., Terry Moon Cronk, *Space-Based Capabilities Critical to U.S. National Security, DOD Officials Say*, Department of Defense News (May 24, 2021), <https://www.defense.gov/News/News-Stories/Article/Article/2629675/space-based-capabilities-critical-to-us-national-security-dod-officials-say/> (noting, as one example, that Secretary of Defense Lloyd J. Austin III has testified that “the growth of Chinese and Russian counter space capabilities presents the most immediate and serious threats to U.S. allied and partner space activities”).

¹⁹ See Andrew Jones, *China’s megaconstellation project establishes satellite cluster in Chongqing*, SpaceNews (Jan. 12, 2022), <https://spacenews.com/chinas-megaconstellation-project-establishes-satellite-cluster-in-chongqing/>.

Radiocommunications Conference (WRC-23).”²⁰ As commenters indicated in that proceeding,²¹ NGSO FSS operations have increasing needs for spectrum and are increasingly bottlenecked, particularly with respect to Ka-band downlink spectrum.²² The 51 GHz band represents a similar opportunity to allocate critical spectrum to NGSO systems, especially where the FCC is contemplating allocating the same spectrum to GSO systems.

The spectrum pipeline should also maximize use of the spectrum already allocated to NGSO FSS systems. In April 2023, the FCC will take important steps to update its spectrum sharing rules. However, the rising importance of NGSO FSS technology requires continued reexamination of spectrum sharing rules, and NTIA should systematically review these rules to ensure that such spectrum is put to its highest and best use among the services sharing it. The current equivalent power-flux density (EPFD) protections for GSO systems at the ITU present a stark example of rules that merit reexamination in light of changing industry and consumer trends. At present, these EPFD limits are overly conservative and fail to reflect current satellite technology for either service, harming consumers and wasting precious spectrum resources.

Promoting spectrum access and management through technology development in next-generation satellite systems requires policies that incentivize competition, sharing, and efficient spectrum use. These include policies that 1) promote the use of interference metrics that foster efficient spectrum sharing and coordination,²³ 2) limit the period of heightened interference protections for incumbent systems to make way for innovation and new entry, and 3) require and promote information sharing among NGSO FSS operators to enable more efficient and accurate spectrum sharing.²⁴ Together, these policies will incentivize operators to design systems that continue to improve how they use and share spectrum.

But encouraging the development and deployment of the right technologies can go much further in maximizing the efficient use of spectrum. Policies should specifically incentivize operators to invest in capabilities and frameworks oriented ultimately toward allowing real-time, dynamic information sharing. At the individual operator level, these technologies include equipping satellites with narrow, steerable beams—such as those employed by the Kuiper System. At the broader industry level, these

²⁰ *Amendment of Parts 2 and 25 of the Commission's Rules to Enable GSO Fixed-Satellite Service (Space-to-Earth) Operations in the 17.3-17.8 GHz Band, to Modernize Certain Rules Applicable to 17/24 GHz BSS Space Stations*, Report and Order and Notice of Proposed Rulemaking, Docket Nos. 20-330, 22-273, FCC 22-63, ¶ 74 (rel. Aug. 3, 2022).

²¹ *See id.*

²² *Id.* ¶ 76.

²³ Specifically, Amazon has advocated for adoption of a degraded throughput methodology to define the levels of interference protection required between NGSO FSS systems with differing spectrum priority. *See Revising Spectrum Sharing Rules for Non-Geostationary Orbit, Fixed-Satellite Service Systems, Notice of Proposed Rulemaking*, IB Docket No. 21-456, RM-11855, FCC 21-123, ¶ 21 (rel. Dec. 15, 2021) (“*Spectrum Sharing NPRM*”); *Revising Spectrum Sharing Rules for Non-Geostationary Orbit, Fixed-Satellite Service Systems, Draft Report and Order and Further Notice of Proposed Rulemaking*, IB Docket No. 21-456, FCC-CIRC2304-03, ¶ 17 (rel. Mar. 30, 2023) (“*Draft Spectrum Sharing Order*”).

²⁴ *See Spectrum Sharing NPRM* ¶¶ 22-23; *see also* Letter from Michael John Carlson, Corporate Counsel, Kuiper Systems LLC, to Marlene H. Dortch, Secretary, FCC, IB Docket No. 21-456, RM-11855, at 4-10 (Dec. 14, 2022) (describing benefits of NGSO FSS information sharing and ways of mitigating related concerns).

policies include development of a neutral, third-party clearinghouse that could facilitate real-time information exchanges between operators—overcoming the technical and administrative challenges of sharing such information.

These technological advances promise to deliver more competition and innovation—and therefore, better and more affordable service—to customers in the U.S. and abroad. With the right incentives, the right policies, and by coordinating the efforts of government and industry, the NTIA and others can help unleash the full potential of next-generation space-based systems.

Conclusion. In closing, an optimal National Spectrum Strategy should feature an assortment of unlicensed, shared, and licensed spectrum to support various technologies and enable a diverse set of stakeholders to innovate and build increasingly efficient ways to affordably connect consumers. Amazon can attest that access to wireless spectrum is essential for the creation and growth of groundbreaking enterprise and consumer technologies and services. We applaud NTIA for prioritizing a National Spectrum Strategy and thank you for the opportunity to share our views.