**Before the**
**FEDERAL COMMUNICATIONS COMMISSION**
**Washington, D.C. 20554**

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| In the Matter of | ) | |
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| Spectrum Requirements for the Internet of Things | ) | ET Docket No. 21-353 |
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# COMMENTS OF NCTA – THE INTERNET & TELEVISION ASSOCIATION

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## INTRODUCTION AND SUMMARY

NCTA – The Internet & Television Association (NCTA)[1] submits these comments in response to the Federal Communications Commission's (FCC or Commission) Notice of Inquiry regarding the current and future spectrum needs of Internet of Things (IoT) devices.[2] As the *NOI* notes, the low barriers to entry of unlicensed spectrum make it attractive for IoT,[3] and many IoT technologies rely on unlicensed and shared spectrum. In addition to providing business and residential broadband services, NCTA's members offer core services that support IoT devices, such as high-speed consumer Wi-Fi, as well as IoT services, including smart home devices and low-power wide-area networks. Consumers depend on these services and the unlicensed spectrum that supports them to keep their homes safe, monitor their health, access information,

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[1] NCTA is the principal trade association of the cable television industry in the United States, which is a leading provider of residential broadband service to U.S. households. Its members include owners and operators of cable television systems serving nearly 80 percent of the nation's cable television customers, as well as more than 200 cable program networks. Cable service providers have invested more than $290 billion over the last two decades to deploy and continually upgrade networks and other infrastructure—including building some of the nation's largest Wi-Fi networks.

[2] *See Spectrum Requirements for the Internet of Things*, Notice of Inquiry, ET Docket No. 21-353, FCC 21-103 (rel. Sept. 30, 2021) (*NOI*).

[3] *See id.* ¶ 10.

and stay connected. Companies are also using 3.5 GHz Citizens Broadband Radio Service (CBRS) spectrum to support IoT deployments. The increasing use and deployment of CBRS services exemplifies the value and utility of shared spectrum resources for a wide variety of IoT and other use cases, making it a prime allocation model for future spectrum bands. NCTA encourages the Commission to continue to support the growth of IoT by identifying ample new unlicensed and shared spectrum bands to accommodate a diverse set of applications and users and to promote competition and innovation in IoT. In particular, we encourage the Commission to work with the National Telecommunications and Information Administration (NTIA) and federal spectrum users to make available the 7125-8400 MHz (7 GHz) band for unlicensed use and the 3100-3450 MHz (Lower 3 GHz) band for CBRS-like shared use without disrupting any existing government operations.

## I. UNLICENSED AND SHARED SPECTRUM ARE CRITICAL FOR IOT GROWTH.

IoT devices have flourished in unlicensed and shared spectrum bands. As the NOI notes:

> [u]nlicensed devices provide spectrum access with low entry barriers; that is, because no license is needed anyone using approved equipment can access the spectrum without paying license fees or obtaining spectrum rights through an auction. . . . Thus, the regulatory barriers to implement an unlicensed IoT system or connect IoT devices in the home or a business are lower.[4]

By freeing technologists from the need to seek permission from government or private exclusive licensees, unlicensed spectrum allows for and promotes more rapid innovation than exclusively licensed spectrum.[5] As the FCC's Spectrum Policy Task force explained in recommending that

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[4] *NOI* ¶ 10.

[5] *See, e.g.*, Philip J. Weiser & Dale N. Hatfield, *Policing the Spectrum Commons*, 74 Fordham L. Rev. 663, 673 (2005), https://ir.lawnet.fordham.edu/flr/vol74/iss2/12; *see also* Press

the Commission apply the "commons model" (i.e., unlicensed) "to significant portions of the spectrum":

> This [unlicensed] approach . . . promotes technological innovation by providing a spectrum environment in which to develop new technologies. Users do not pay for access to the spectrum, so they will channel their investment exclusively into developing robust technology that can function in this environment and continue to function as the environment grows more congested.[6]

For this reason, innovation by equipment manufacturers has been heavily concentrated on unlicensed technologies, and unlicensed spectrum bands have emerged as playgrounds for the experimentation that is critical for continuing development of new wireless innovations, including in IoT.[7] For example, most smart home IoT devices operate on Wi-Fi networks in the 2.4 GHz and 5 GHz band (and IoT devices in the 6 GHz band are emerging). These include smart thermostats, home security systems, smart locks, garage door openers, smart refrigerators,

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Release, House Committee on Energy and Commerce, Bipartisan Committee Leaders Welcome Innovative Spectrum Testing (Jan. 29, 2016), https://energycommerce.house.gov/newsroom/press-releases/bipartisan-committee-leaders-welcome-innovative-spectrum-testing ("An environment that fosters the development of next generation technologies is what makes America the greatest place in the world to do business, create jobs, and develop state-of-the-art communications tools for consumers. . . . The unlicensed bands were founded on permissionless innovation and sharing."); Anna Eshoo & Ajit Pai, *The Feds Have to Act to Get America Faster Wi-Fi*, Wired (Feb. 7, 2016), http://www.wired.com/2016/02/the-feds-have-to-act-to-get-america-faster-wi-fi (stating that unlicensed spectrum "is a key platform for innovation, letting entrepreneurs experiment with disruptive new technologies").

6 *Spectrum Policy Task Force Report*, ET Docket No. 02-135, at 39 (Nov. 2002) (*Spectrum Policy Task Force Report*).

7 *See, e.g.*, *Section 257 Triennial Report to Congress Identifying and Eliminating Market Entry Barriers for Entrepreneurs and Other Small Businesses*, Report, 31 FCC Rcd. 12,037 ¶ 57 (2016) ("The Commission's experimental and unlicensed spectrum policies, developed in OET, have enabled much of the commercial research and development related to new wireless technologies, and the widespread deployment of technologies such as Wi-Fi, Bluetooth, RFID, ZigBee, and others.").

ovens and other appliances.[8] Bluetooth Low Energy, which operates in the unlicensed 2.4 GHz band, is "the technology of choice for many IoT designers" and some see it becoming "the de-facto standard of connectivity in low-power, low-cost IoT devices."[9] Zigbee is designed to communicate data through noisy radiofrequency environments, making it ideal for IoT applications in the 2.4 GHz and 900 MHz unlicensed bands.[10] Many low power wide area network (LPWAN) technologies such as LoRa, Sigfox, Ingenu, Weightless, and Symphony Link, also rely on unlicensed spectrum, including in many cases in the 900 MHz band.[11] These LPWANs allow many low cost, low power devices to be deployed and collect data that can be analyzed at a central point. LPWAN is useful for a wide variety of use cases, including asset tracking, smart cities, precision agriculture, healthcare, and other applications.

Recently, entities also have begun to use 3.5 GHz shared CBRS spectrum for IoT

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[8] *See NOI* ¶ 10 ("[M]ost in-home IoT devices such as thermostats, water or gas leak detectors, and smart home controllers connect to the Internet using unlicensed Wi-Fi connections."); Simon Hill, *The Ultimate Guide to Setting Up Your Smart Home*, Wired (July 20, 2021), https://www.wired.com/story/how-to-set-up-smart-home.

[9] Jaya Kathuria, *Smart World of IoT, Bluetooth Low Energy, and The Swiss Army Knife of Connectivity!*, Embedded Computing Design (Sept. 18, 2019) https://www.embeddedcomputing.com/technology/iot/smart-world-of-iot-bluetooth-low-energy-the-swiss-army-knife-of-connectivity; *see also Learn About Bluetooth, Bluetooth Technology Overview*, Bluetooth SIG, https://www.bluetooth.com/learn-about-bluetooth/tech-overview (last visited Nov. 1, 2021) (noting that Bluetooth operates in the 2.4 GHz band).

[10] *See ZigBee Wireless Mesh Networking*, Digi, https://www.digi.com/solutions/by-technology/zigbee-wireless-standard (last visited Oct. 24, 2021).

[11] *See, e.g.*, *What are LoRa and LoRaWAN?*, The Things Network, https://www.thethingsnetwork.org/docs/lorawan/what-is-lorawan (last visited Nov. 1, 2021); *SigFox Vs. LoRa: A Comparison Between Technologies & Business Models*, Link Labs (May 31, 2018), https://www.link-labs.com/blog/sigfox-vs-lora.

applications.[12] CBRS General Authorized Access (GAA) shared spectrum has proven to be a critical complement to licenses in the band, allowing Industrial Internet of Things (IIoT) network operators to flexibly add capacity in key locations where data use is particularly intense, without needing to rely on exclusively licensed additional spectrum.[13] CBRS-based LTE networks also provide enhanced throughput and security, which makes them ideally suited for certain enterprise applications.[14]

The broad range of available IoT technologies, such as those described above, is transforming the way we live, engage with technology, and do business; NCTA's members are part of that story. Millions of connected devices, including IoT devices, attach to our members' broadband networks, in many cases through the Wi-Fi networks and equipment provided and installed by NCTA members. One NCTA member estimates that 450 million devices are

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[12] *See* Lee Doyle, *Industry Voices–Doyle: CBRS Will Impact Enterprise IoT Connectivity*, FierceWireless (May 18, 2020), https://www.fiercewireless.com/iot/industry-voices-doyle-cbrs-will-impact-enterprise-iot-connectivity; *Enhancing IOT Deployments with OnGO, Using the 3.5 GHz Band*, OnGo Alliance (Apr. 21, 2020), https://ongoalliance.org/enhancing-iot-deployments-with-ongo-using-the-cbrs-spectrum-band; Letter from Catherine Wang, Counsel for Deere & Company, to Marlene H. Dortch, Secretary, FCC, GN Docket No. 20-32 et al., at 2 (Oct. 13, 2021).

[13] *See* Monica Paolini, I*ndustry Voices – Paolini: Why Did Utilities Pay So Much for CBRS Licenses?*, FierceWireless (Sept. 22, 2020), https://www.fiercewireless.com/private-wireless/why-did-utilities-pay-so-much-for-cbrs-licenses; *see also* Bevin Fletcher, *Exploring CBRS for Industrials with Anterix, Cradlepoint, Nokia – Special Report*, FierceWireless (Oct. 19, 2020) https://www.fiercewireless.com/private-wireless/exploring-cbrs-for-industrials-anterix-cradlepoint-nokia (discussing the use of GAA for private networks to support industrial and utility use cases).

[14] *See* Mike Foss, *CBRS vs. Private LTE Networks in Data Centers*, Vision Technologies (Apr. 22, 2021), https://www.visiontechnologies.com/newsroom/articles/cbrs-vs-private-lte-networks-data-centers; *see also* Linda Hardesty, *AT&T Teams with Ericsson for Private Wireless Networks on CBRS Spectrum*, FierceWireless (Oct. 15, 2020) https://www.fiercewireless.com/private-wireless/at-t-teams-ericsson-for-private-wireless-networks-cbrs-spectrum (noting a deal between AT&T and Ericsson to provide private LTE networks to enterprises using GAA).

connected to its network alone.[15] NCTA's members also offer IoT home security and automation services using the unlicensed Wi-Fi and Zigbee standards, which power security cameras, smart locks, sensors, and smart lighting and thermostats.[16] They also provide applications that allow consumers to easily manage these smart home devices.[17] Even in commercial settings, Wi-Fi is often the go-to IoT network technology. For example, DeepBlue, a Comcast Business Company, provides managed Wi-Fi solutions to support IoT functionality in hospitality, retail, and entertainment venues such as contactless check-in, keyless entry, touchless controls and entertainment, UV disinfecting robots, AR/VR, wearables, smart elevators and lobbies, and others, as well as Location Based Services for tracking assets and securing safety of staff.[18] Cable operators also offer LPWAN services, including using spectrum in the 900 MHz band,[19] for building management, asset and fleet management, environmental monitoring, predictive maintenance, smart cities, smart healthcare, smart retail, and precision agriculture.[20]

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15 *See* Reply Comments of Charter Communications, Inc., ET Docket No. 21-232, EA Docket No. 21-233, at 3 (filed Oct. 18, 2021).

16 *See, e.g., Homelife Smart Home & Security*, Cox, https://www.cox.com/residential/homelife.html (last visited Nov. 1, 2021); *Help keep the people and places you care about safe*, Xfinity Home, https://www.xfinity.com/learn/home-security (last visited Nov. 1, 2021).

17 *See, e.g., Homelife Smart Home & Security*, Cox, https://www.cox.com/residential/homelife.html (last visited Nov. 1, 2021); *Help keep the people and places you care about safe*, Xfinity Home, https://www.xfinity.com/learn/home-security (last visited Nov. 1, 2021).

18 *See generally* DeepBlue, https://www.deepbluecommunications.com (last visited Nov. 1, 2021).

19 *See generally*, MachineQ, A Comcast Company, https://machineq.com/ (last visited Nov. 1, 2021); Cox2M Connected Asset Services, https://www.cox2m.com/#about (last visited Nov. 1, 2021).

20 *See About*, Cox2M Connected Asset Services, https://www.cox2m.com/#about (last visited Nov. 1, 2021); *Solutions*, MachineQ, A Comcast Company, https://machineq.com/solutions (last visited Nov. 1, 2021).

Consumer demands for IoT services are increasing rapidly, creating a growing need for more unlicensed and shared bandwidth to support them. Cisco projects that, globally, there will be 3.6 networked devices—including IoT devices—per capita by 2023, up from 2.4 in 2018, leading to a total of 29.3 billion networked devices by 2023 (up from 18.4 billion in 2018).[21] Statista Research estimates that $1.1 trillion U.S. dollars will be spent on IoT globally by 2023.[22] Machine-to-machine (M2M) connections (another sector associated with IoT) will grow from 33 percent of global connected devices and connections in 2018 to 50 percent in 2023,[23] making M2M the fastest-growing device and connections category covered in Cisco's Annual Internet report.[24] Cisco highlights in particular the important role that Wi-Fi 6 and 6E will play in "enabl[ing] dense IoT deployments," also noting that "Wi-Fi has a powerful role to play alongside other small cell technologies in delivering key use cases going forward in the 5G Era."[25] Indeed, the low latency capabilities of Wi-Fi 6 and 6E will make these technologies critical in delivering real-time IoT communications.[26]

As consumers rely more heavily on connected IoT devices, they use an increasing number of devices and amount of bandwidth. To keep pace with this ever-growing demand and

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21 Cisco, *Annual Internet Report (2018-2023) White Paper* 1, 6 (2020) (Cisco Annual Internet Report), https://www.cisco.com/c/en/us/solutions/collateral/executive-perspectives/annual-internet-report/white-paper-c11-741490.pdf.

22 Lionel Sujay Vailshery, *Internet of Things (IoT) Spending Worldwide 2023* (Jan. 14, 2021), https://www.statista.com/statistics/668996/worldwide-expenditures-for-the-internet-of-things.

23 Cisco Annual Internet Report at 1, 6.

24 *Id.*

25 *Id*. at 14.

26 See *id.* at 25 ("Low-latency real-time communications and high-definition video applications will leverage the multi-access edge enabled by 5G and Wi-Fi 6.").

the rate at which innovators bring new IoT technologies to market, it is important for the FCC to adopt flexible sharing and unlicensed allocation frameworks to maximize the spectrum that can be made available. As Dr. Raul Katz of Columbia University previously noted, early IoT growth was hampered by the risk of congestion in unlicensed spectrum.[27] He projected that the Commission's decision to open the 6 GHz band to low-power indoor devices will materially accelerate the broader deployment of IoT devices, with a spillover contribution to the GDP of $44.03 billion.[28] Making additional unlicensed and shared spectrum resources available soon will similarly support continued growth and innovation in IoT.

## II. THE COMMISSION SHOULD DESIGNATE ADDITIONAL UNLICENSED AND SHARED SPECTRUM, INCLUDING IN THE 7 GHZ AND LOWER 3 GHZ BANDS, TO SUPPORT IOT GROWTH.

Unlicensed and shared spectrum bands support innovation and economic growth for a host of technologies that share those frequencies. NCTA has long been a vocal advocate for a balanced spectrum pipeline that considers the need for unlicensed, shared, and licensed frequencies, and urges the Commission to make available additional unlicensed and shared spectrum to support IoT innovation. Doing so would be an effective way to facilitate spectrum access for a diverse range of IoT developers and network operators. In particular, the 7 GHz and Lower 3 GHz bands hold promise for unlicensed and licensed shared use, respectively.

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[27] Telecom Advisory Services, LLC, *Assessing the Economic Value of Unlicensed Use in the 5.9 GHz & 6 GHz Bands* 42 (Apr. 2020), http://wififorward.org/wp-content/uploads/2020/04/5.9-6.0-FINAL-for-distribution.pdf.

[28] *Id.* at 42, 46-47.

### A. Designating Additional Spectrum for Unlicensed and Shared Use Will Promote Innovation in Sharing Technologies and Diversify the Base of IoT Innovators.

Identifying additional unlicensed and shared spectrum to support IoT growth would be smart spectrum policy, as it would help promote continued, rapid innovation in spectrum sharing technologies. Because unlicensed spectrum is open to everyone, subject to interference guardrails to protect other shared users from harmful interference, unlicensed innovators have strong incentives to develop and implement technologies that do not interfere with others and allow for large numbers of devices to share the same frequencies.[29] The "listen-before-talk" protocol employed by Wi-Fi is a prime example: Wi-Fi devices "listen" for existing signals in their assigned channel and do not "talk" (i.e., transmit) on that channel until it is clear, thereby avoiding harmful interference and allowing for efficient shared use of the bands in which Wi-Fi operates.[30] Facilitating shared access effectively creates new capacity for spectrum use without actually consuming additional spectrum. With no readily available "greenfield" spectrum remaining, continuing to promote the development of such sharing technologies is of paramount importance.

One recent study compared the leading LPWAN technologies for IIoT use cases. Naturally, and for the reasons discussed above, most of these technologies use unlicensed spectrum. And notably, for all of the unlicensed LPWAN technologies, sharing-friendly cognitive radio capability—which can monitor the spectrum and automatically switch channels

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[29] *See Spectrum Policy Task Force Report* at 39.

[30] *See, e.g.*, *Listen Before Talk*, MultiTech (2021), https://www.multitech.net/developer/software/lora/listen-before-talk.

based on changes in the dynamic radio frequency environment[31]—either already exists or is being considered. By contrast, none of the licensed-only LPWAN technologies are currently employing or even considering such capabilities.[32]

| Technology | Operation | Cognitive Radio Capability |
|---|---|---|
| Sigfox | Unlicensed | To be considered |
| Weightless-W | Licensed/Unlicensed | Yes |
| Nwave (Weightless-N) | Unlicensed | Yes (Uplink) |
| LoRa | Unlicensed | Yes |
| Symphony Link | Unlicensed | To be considered |
| NB-IoT | Licensed | No |
| LTE-M | Licensed | No |

*Source:* Nahla Nurelmadina et al., *A Systematic Review on Cognitive Radio in Low Power Wide Area Network for Industrial IoT Applications*, Sustainability, at 5, tbl.2 (2021).

This demonstrates that there may be fewer incentives to develop and implement IoT spectrum sharing capabilities where the spectrum being used has been licensed for exclusive use—or, at least, IoT sharing in licensed spectrum may present more complexities. In unlicensed and shared bands, there are much stronger opportunities and incentives for such innovation.[33]

Moreover, many of the most cutting-edge sharing technologies are being developed for and deployed in unlicensed and shared spectrum bands. From the 3.5 GHz Spectrum Access System to the Automated Frequency Coordination system under development in the 6 GHz band, rules authorizing unlicensed and shared spectrum use have led to new and innovative ways to

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31 *See, e.g.*, *Cognitive Radio for Public Safety*, FCC, https://www.fcc.gov/general/cognitive-radio-public-safety (last visited Nov. 1, 2021).

32 Nahla Nurelmadina et al., *A Systematic Review on Cognitive Radio in Low Power Wide Area Network for Industrial IoT Applications*, Sustainability 5, tbl.2 (2021), https://www.mdpi.com/2071-1050/13/1/338.

33 *See id*. at 8 (describing the importance of enabling "multiple users [to] simultaneously use a channel" in order to use unlicensed spectrum in a sustainable way).

share while preventing harmful interference to critical federal or other incumbents. By designating ample unlicensed and shared spectrum for IoT, the FCC can promote rapid development of spectrum sharing technology innovations, opening up new ways to make even better and more efficient use of scarce spectrum resources.

Ensuring a robust pipeline of unlicensed and shared spectrum to support IoT growth and innovation would also serve some of the Communications Act's core public interest objectives by broadening—and diversifying—the base of IoT innovators beyond the relatively narrow class of entities that can feasibly access licensed spectrum. For example, the Commission has recognized that increased unlicensed spectrum access creates opportunities for small businesses and benefits Americans in both urban and rural areas.[34] As Chairwoman Rosenworcel has said, "[u]nlicensed spectrum, like Wi-Fi, democratizes Internet access, encourages permissionless innovation, and is responsible for $140 billion in economic activity every year. . . . So in any effort to increase the licensed spectrum pipeline, we need to explore a cut for unlicensed."[35] Moreover, innovative shared spectrum models also make spectrum more accessible for a broad range of businesses. As discussed in more detail below, the 3.5 GHz CBRS auction, for

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[34] *See, e.g.*, *Section 257 Triennial Report to Congress, Identifying and Eliminating Market Entry Barriers for Entrepreneurs and Other Small Businesses*, Report, 19 FCC Rcd. 3034, ¶¶ 140-44 (2003).

[35] *Oversight of the Federal Communications Commission: Hearing Before the S. Comm. on Commerce, Science & Transportation*, 114th Cong. (Mar. 2, 2016) (Statement of Commissioner Jessica Rosenworcel at 1), https://docs.fcc.gov/public/attachments/DOC-338050A1.pdf.

example, resulted in significant participation even in rural areas, and enabled spectrum access by a much larger and more diverse range of licensees than prior spectrum auctions.[36]

NCTA agrees with the Commission that expanding unlicensed and shared spectrum access supports "the growth of the IoT; connecting appliances, machines, meters, wearables, and other consumer electronics as well as industrial sensors for manufacturing,"[37] For all of the reasons identified above, authorizing additional unlicensed and shared spectrum is one of the most helpful steps the FCC can take to promote the growth of IoT.

### B. The Commission Should Enable Unlicensed Use of the 7 GHz Band.

The 7 GHz band is currently allocated for Federal use, but holds great potential for commercial unlicensed sharing, as policymakers have already recognized. Multiple bipartisan bills in Congress have targeted the 7 GHz band for unlicensed or shared use. For example, the AIRWAVES Act would have directed NTIA and the FCC to coordinate on making as much of the band as possible available for such use.[38] The SHARE Act similarly targeted the band for shared federal and commercial use under a CBRS-like framework.[39] NTIA already has begun

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[36] *See* Press Release, Statement of Claude Aiken, President and CEO of the Wireless Internet Service Providers Association, WISPA's 10 Takeaways from the CBRS Auction (Sept. 9, 2020) (WISPA Auction 105 Statement), http://wispa.org/news_manager.php?page=22547; *See* Press Release, FCC, FCC Announces Winning Bidders of 3.5 GHz Band Auction, at Attachment A (Sept. 2, 2020) (FCC Auction 105 Press Release), https://www.fcc.gov/document/fcc-announces-winning-bidders-35-ghz-band-auction.

[37] *Unlicensed Use of the 6 GHz Band; Expanding Flexible Use in Mid-Band Spectrum Between 3.7 and 24 GHz*, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd. 3852 ¶ 3 (2020) (*6 GHz Order*); *see also id.* at 3993 (Statement of Commissioner Geoffrey Starks) (stating that newly authorized unlicensed spectrum "is expected to . . . unleash a wave of innovation for the Internet of Things").

[38] *See* AIRWAVES Act, H.R. 4953, S. 1682, 115th Cong. § 5(b) (2018).

[39] *See* SHARE Act, H.R. 4462, 116th Cong. § 3(a)(3) (2019).

the process of studying the feasibility of introducing commercial use into the 7 GHz band, having undertaken such work in response to a 2018 Presidential Memorandum.[40]

From a technology perspective, 7 GHz is well-positioned to meet the needs of next-generation unlicensed IoT and broadband devices. Because the 7 GHz band is immediately adjacent to the 6 GHz band that the Commission made available in 2020 for shared unlicensed use, it would be straightforward to develop new 7 GHz chips and devices, including for IoT. Moreover, the next-generation Wi-Fi standard currently under development, Wi-Fi 7, will introduce 320 megahertz channels, requiring more spectrum than currently available in 6 GHz.[41] Additional spectrum in the 7 GHz range would create the multiple 320 megahertz channels needed to support Wi-Fi 7, and the advanced AR/VR, Holographic Type Communications, distributed Artificial Intelligence, telemedicine, and other high-bandwidth, high-speed applications that Wi-Fi 7 is envisioned to unleash.

Critically, unlicensed devices, including IoT operations, are well-positioned to work around Federal users and allow them to stay in place. Unlicensed users are well-versed in sharing spectrum where and when it can be used, avoiding the frequencies that are occupied by Federal or other users. As New America's Michael Calabrese, then a member of the Commerce Spectrum Management Advisory Committee, has observed, the "underutilized" 7 GHz band may be particularly suitable for "low-power unlicensed networks," given that "it would be extremely difficult to clear federal users from large contiguous portions of" the band to make it suitable for

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40 *See* Press Release, NTIA, NTIA Releases First Annual Report on Spectrum Repurposing (Sept. 3, 2019), https://www.ntia.doc.gov/press-release/2019/ntia-releases-first-annual-report-spectrum-repurposing.

41 *See* Catherine Sbeglia, *Wi-Fi 7: What Is It and When Should You Expect It?*, RCR Wireless (Jan. 27, 2021), https://www.rcrwireless.com/20210127/network-infrastructure/wi-fi/wi-fi-7-what-is-it-and-when-should-you-expect-it.

licensed use.[42] Shared unlicensed use is a cost-effective and efficient approach to enabling commercial access to the band because it avoids a disruptive and expensive relocation process for federal users. This approach to 7 GHz would more speedily bring the spectrum into commercial use, without waiting for a relocate-and-auction process to take place, in the event such an approach was even feasible. Moreover, the technical rules in portions of the 6 GHz band were crafted specifically to protect Fixed Service (FS) operations[43] and form a baseline that could likely be amended in relevant respects to facilitate protection for the Federal FS operations in 7 GHz.

As demand for Wi-Fi and the IoT devices that depend on unlicensed spectrum grows, the Commission should identify the next bands in its unlicensed spectrum pipeline. The 7 GHz band would be an ideal location for the next generation of unlicensed technologies, including the millions of IoT devices expected to be deployed in the United States in the coming years.

### C. The Commission Should Enable Shared Use of the Lower 3 GHz Band.

In addition to unlicensed spectrum, shared licensed spectrum can also play an important role in meeting the spectrum needs of IoT devices. As described above, some IoT use cases, including mission critical and low-latency operations may be best suited to licensed shared

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[42] Howard Buskirk, *NTIA Studying Sharing in 7.125-8.4 GHz Band; Controversy Expected*, Communications Daily (Oct. 2, 2019), https://communicationsdaily.com/article/view?search_id=491195&id=808296.

[43] *See 6 GHz Order* ¶ 20 ("To protect incumbent fixed microwave operations in these bands, the Commission proposed that unlicensed devices at [standard] power levels only be permitted access to spectrum under the control of an Automated Frequency Coordination (AFC) system, which would establish exclusion zones where unlicensed devices could not operate."), ¶ 112 ("We find that fixed microwave receivers will be protected from harmful interference from unlicensed indoor low power devices operating at the power levels we are authorizing."); *see also* ¶ 99 (describing the rules the FCC adopted to prevent harmful interference to incumbents from unlicensed indoor low power devices).

spectrum. The 3.5 GHz band's three-tiered access system has proven useful for purpose-built networks for factories, warehouses, and utilities, including for IoT. The county-size license areas the Commission adopted for the 3.5 GHz band, combined with lower power levels and the availability of GAA spectrum to complement the available licensed frequencies made this band a truly unique opportunity for non-traditional license holders to access spectrum. As noted above, participation in the 3.5 GHz auction demonstrated significant interest from a larger and more diverse range of bidders than in any previous auction to serve communities of all sizes across the country. The Commission sold more than 91.1 percent of available licenses, demonstrating significant interest even in rural areas.[44] Moreover, the 228 winning bidders are diverse in size and business focus, including not only large mobile wireless carriers, but also regional carriers, wireless internet service providers, cable companies, manufacturers of agricultural equipment, universities, real estate firms, energy companies, electric utilities, tribes, and others.[45]

The Lower 3 GHz band is widely viewed as suitable for a sharing framework similar to CBRS, including an unlicensed or licensed-by-rule tier, comparable to GAA. Congress required NTIA and the FCC to coordinate and report on the feasibility of sharing the 3.1-3.55 GHz band in the MOBILE NOW Act (part of RAY BAUM's Act).[46] NTIA has done significant work toward assessing the feasibility of such sharing in the Lower 3 GHz band and has said that it is

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[44] FCC Auction 105 Press Release; WISPA Auction 105 Statement.

[45] *See* FCC Auction 105 Press Release.

[46] Consolidated Appropriations Act, 2018, Pub. L. 115-141, Division P, Title VI, § 605(a), 132 Stat. 348, 1100.

"very, very optimistic about it."[47] And as for the FCC, the Wireless Telecommunications Bureau (WTB) and Office of Engineering and Technology already have been working with NTIA and the Department of Defense to examine "what steps may be necessary to allow commercial wireless service, licensed or unlicensed, to share" the Lower 3 GHz band.[48] Chairwoman Rosenworcel has indicated that WTB's review is focused, among other things, on "more innovative spectrum sharing policies like we have in the CBRS band," as well as "being mindful of the importance of unlicensed use."[49] Numerous stakeholders also have already expressed support for adopting a CBRS-like sharing framework in the Lower 3 GHz band.[50]

The Commission should build on the successful CBRS model in the Lower 3 GHz band by adopting the county-sized licenses that were critical to the success of the CBRS auction. It should also adopt low power levels, akin to those adopted in the CBRS band, which would promote spectral efficiency through spatial reuse, support a wider variety of use cases including

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47 *Our Wireless Future: Building a Comprehensive Approach to Spectrum Policy: Hearing Before the Subcomm. On Comms. And Technology of the H. Comm. on Energy and Commerce*, 116th Cong. (July 16, 2019) (Answer of Derek Khlopin, Senior Policy Advisor, NTIA, at 1080-1103), https://docs.house.gov/meetings/IF/IF16/20190716/109797/HHRG-116-IF16-Transcript-20190716.pdf ("We started aggressively looking at [the 3.1-3.55 GHz] range, what we found in the short-term is the upper 100, the 3450-3550, presents the opportunity in the near-term to make spectrum available. Having said that, we'll continue to look for the larger block as well . . . [w]e're very, very optimistic about it.").

48 *Facilitating Shared Use in the 3100-3500 MHz Band*, Report and Order and Further Notice of Proposed Rulemaking, 35 FCC Rcd. 11,078 ¶ 19 (2020).

49 *Facilitating Shared Use in the 3100-3500 MHz Band*, Second Report and Order, Order on Reconsideration, and Order of Proposed Modification, 36 FCC Rcd. 5987, 6091 (2021) (Statement of Acting Chairwoman Jessica Rosenworcel); *see also id.* at 6097 (Statement of Commissioner Geoffrey Starks) (discussing "the benefits of opportunistic use" and "hop[ing] to see consideration of this approach in future spectrum proceedings").

50 *See, e.g.*, Comments of CommScope, Inc., WT Docket No. 19-348, at 4-5 (filed Feb. 21, 2020); Comments of Dynamic Spectrum Alliance, WT Docket No. 19-348, at 1, 4 (filed Feb. 24, 2020); Michael Calabrese, *Use It or Share It: A New Default Policy for Spectrum Management* 40-43 (2021), https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3762098.

IoT,[51] and help to ensure coexistence with in-band federal government users that could stay in place. In short, consideration of the Lower 3 GHz band for commercial use is already well underway and the Commission should carefully examine the potential benefits of a shared spectrum model for the band that could promote widespread access to spectrum as well as next-generation spectrum sharing innovations, including for IoT.

## CONCLUSION

For the foregoing reasons, NCTA encourages the Commission to make additional unlicensed and shared spectrum available, which will support growth and innovation in IoT. In particular, the Commission should move forward to designate the 7 GHz band for unlicensed use and the Lower 3 GHz band for shared use pursuant to a CBRS-like sharing framework.

Respectfully submitted,

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[51] *See Amendment of the Commission's Rules with Regard to Commercial Operations in the 3550-3650 MHz Band*, Report and Order and Second Further Notice of Proposed Rulemaking, 30 FCC Rcd. 3959 ¶ 214 (2015) ("[L]ower power limits may lead to greater spatial reuse of the band, reduced coexistence challenges, and increased aggregate network capacity.").