

**Before the
NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION
U.S. DEPARTMENT OF COMMERCE
Washington, D.C. 20230**

In the Matter of)
Advancement of 6G Telecommunications) Docket No. NTIA-2024-0001
Technology)

**COMMENTS OF
NCTA – THE INTERNET & TELEVISION ASSOCIATION**

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INTRODUCTION AND SUMMARY

NCTA – The Internet & Television Association (“NCTA”) appreciates the opportunity to submit comments in response to the National Telecommunications and Information Administration’s (“NTIA”) *Notice* requesting input on the current state of 6G technology development.¹ We offer these comments to help NTIA plan for a 6G future that will necessarily depend on the wireless networks of cable providers and countless others beyond traditional mobile network operators (“MNOs”).

Cable providers are already key players in the wireless industry. For years, NCTA’s members have invested to build upon their extensive wired networks to provide real, sustained competition to traditional nationwide mobile carriers. The cable industry maintains vast, ubiquitous fixed network assets in over 345 million households globally and makes gigabit speeds available in over 115 million U.S. households.² The ubiquity of these wireline network assets enables cost-effective wireless services throughout the United States. In addition to providing home and business Wi-Fi, NCTA members have deployed millions of Wi-Fi hotspots to provide connectivity on the go. More recently, cable providers have developed new competitive wireless offerings, which have grown to 16 million subscribers.³ Those networks are increasingly using shared-licensed spectrum in the Citizens Broadband Radio Service

¹ See *Advancement of 6G Telecommunications Technology*, 89 Fed. Reg. 45648 (May 23, 2024) (“*Notice*”).

² See *Five Things You (Probably) Didn’t Know About CableLabs*, INFORM[ED] BY CABLELABS (July 11, 2018), <https://www.cablelabs.com/blog/5-things-about-cablelabs-innovative-technologies>.

³ See *Charter Announces Second Quarter 2024 Results*, CHARTER COMMUNICATIONS (July 26, 2024), <https://corporate.charter.com/newsroom/charter-announces-second-quarter-2024-results>; *Comcast Reports 2nd Quarter 2024 Results*, COMCAST (July 23, 2024), <https://www.cmcsa.com/news-releases/news-release-details/comcast-reports-2nd-quarter-2024-results>.

(“CBRS”) band. Combined together, cable companies’ mobile wireless offerings represent the fourth largest mobile network in the country and meaningful competition to the networks of the three dominant wireless carriers.

Cable providers thus offer an important perspective on the roles of unlicensed and shared-licensed network models for connecting consumers, not only in the 5G era, but also looking ahead to 6G. Take Wi-Fi, for example: through next-generation broadband networks, cable providers are increasingly delivering ultra-fast connections to homes and businesses, with gigabit Wi-Fi to connect end-user devices. Wi-Fi is far more, though, than just home and business internet access. Wi-Fi and other unlicensed technologies carry over half of *all* global internet traffic, which in turn supports licensed (and wired) networks as well. More than 88% of cable operators’ mobile data traffic is offloaded to Wi-Fi networks,⁴ and nationwide mobile carriers likewise rely on Wi-Fi to offload large percentages of data traffic and free up capacity.

Despite the importance of Wi-Fi and shared spectrum use, however, American wireless policy has for decades favored one particular business model: high-power, wide-area, exclusive use. That policy has been advanced via numerous mechanisms—broad Commercial Mobile Radio Services (“CMRS”) forbearance, preemption of state regulation for CMRS, and, most significantly, adoption of exclusive licensing regimes requiring clearing and relocation of incumbent operators in successive new high-value spectrum bands. These actions have led to the concentration in three large MNOs of approximately 78% of all spectrum in the Federal

⁴ Comcast subscribers offload more than 90% of mobile-originated data over Wi-Fi, and Charter subscribers offload more than 88% of mobile-originated data over Wi-Fi. *See* Jack Reid, *Comcast and Charter Are in a Better Position Than Smaller Cable Companies to Resist Fixed Wireless Competition, S&P Global Ratings Says*, NEXTTV (June 5, 2024), <https://www.nexttv.com/news/comcast-and-charter-are-in-a-better-position-than-smaller-cable-companies-to-resist-fixed-wireless-competition-sandp-global-ratings-says>.

Communications Commission’s (“FCC”) overall spectrum screen, measured on a MHz-POPs basis.⁵ These operators demand an ever-growing amount of new spectrum, and they focus their resources on spectrum acquisition rather than investment in network densification with their existing spectrum holdings. As a result, overall spectrum usage and efficiency is much lower than it should be, and MNO promises regarding 5G use cases have fallen flat in many ways.⁶

To deliver the ubiquitous connectivity NTIA envisions, 6G must be far more than just another generation of yesterday’s cellular network. For starters, mobile carriers must make the necessary investments to densify their 5G networks and use and deploy the spectrum they have collected. Unlike its predecessors, 5G offers a variety of deployment scenarios that can utilize diverse spectrum portfolios. From macro tower to small cells, and even to femtocells, 5G technology does not require exclusive-use licenses—allowing bands with coexistence frameworks, like the CBRS band, to deliver the benefits of 5G. Yet, even today, 5G and 5G-Advanced have not fully matured. For example, the promised use cases of 5G URLLC: Ultra-Reliable and Low Latency Communications, eMBB: Enhanced Mobile Broadband, and mMTC: Massive Machine-Type Communications have not been realized and delivered yet, and in many areas 5G is hardly distinguishable from 4G for consumers (if they are able to get 5G service at all). A rush toward policy decisions on 6G while MNOs have yet to fully deliver on the promises of 5G will not serve the public interest.

⁵ See *Communications Marketplace Report*, Report, 37 FCC Rcd. 15514, 15580 ¶ 86 (2022).

⁶ See, e.g., Michael Koziol, *5G Networks Are Performing Worse. What’s Going On?*, IEEE SPECTRUM (May 6, 2023), <https://spectrum.ieee.org/5g-rollout-disappointments>; John English, *Was 5G Overhyped? Reaching 5G’s Promised Potential Will Require Greater Network Visibility (Reader Forum)*, RCR WIRELESS NEWS (Mar. 4, 2024), <https://www.rcrwireless.com/20240304/opinion/was-5g-overhyped-reaching-5gs-promised-potential-will-require-greater-network-visibility-reader-forum>.

When the time comes to transition from 5G to 6G, it will require a heterogeneous network environment combining existing high-power coverage networks with lower-power microcell networks to deliver capacity, indoor private wireless networks using shared spectrum, and robust Wi-Fi and other unlicensed technologies to carry massive amounts of data with high throughput and low latency. As described above, Wi-Fi networks already carry the vast majority of all internet traffic, terminating even the great majority of mobile traffic. Shared-use frameworks are providing new opportunities in bands subject to complex incumbencies and are poised to do more, especially with technical enhancements such as massive Multiple Input Multiple Output and small-cell based densification as driving components. But we cannot take advantage of these new opportunities if our policies continue to privilege the business model of MNOs, who already hold a massive proportion of the most valuable spectrum resources.

In these comments, NCTA discusses the importance of this heterogenous-network approach to 6G, the ways NTIA can promote developments to enable spectrum-efficient 6G use cases and avoid mistakes made with 5G, and how this approach to 6G will advance U.S. interests and America’s role as a global technology leader.

I. TO REALIZE THE GOAL OF “PERVASIVE AND SEAMLESS CONNECTIVITY,” 6G WILL REQUIRE A COMBINATION OF UNLICENSED, SHARED, AND EXCLUSIVE-LICENSED NETWORKS.

The *Notice* recognizes, in **Question 5**, that “[p]revious commercial wireless generations have been deployed and operated predominantly by dedicated Mobile Network Operators” and seeks comment on which “barriers need to be addressed to enable 6G adoption” among “other types of entities” and “[m]ore recent use cases” than commercial mobile service.⁷ The answer to that important question is clear: to reduce barriers for 6G adoption beyond operators of one

⁷ *Notice* ¶ 5.

particular network model, NTIA should recognize the successes and promote the value of *other* networking models. Indeed, the United States joined many other governments earlier this year in committing to advance “6G technologies that use spectrum efficiently and incorporate spectrum sharing mechanisms by design to coexist with incumbent service providers.”⁸

The dominant wireless carriers wrongly argue that the United States should understand 6G as referring only to their wide-area, high-power coverage networks and excluding unlicensed technologies, spectrum sharing, and private wireless systems. This position defies the reality of how networks actually operate today (*e.g.*, the majority of mobile-originated traffic is carried on Wi-Fi, not high-power exclusive-licensed networks), nor does it reflect how networks will operate in the future. The same wireless carriers promised investment in 5G small cell deployment, but failed to invest to densify their 5G networks as expected, resulting in inefficient spectrum use and disappointment surrounding the promise of 5G.

NTIA should instead explicitly recognize that the power of 6G lies in its heterogeneous nature and should adopt policies that advance unlicensed, shared-licensed, and private wireless networks. Ubiquitous connectivity should be the goal for 6G, with networks “converged” from the consumer or end-user perspective. That will require heterogeneous high-capacity, low-latency networks rather than only the inflexible high-power coverage networks of the past. In a 2023 report on 6G, the Commerce Spectrum Management Advisory Committee (“CSMAC”), which was created by the Department of Commerce to advise NTIA on a broad range of spectrum

⁸ Joint Statement Endorsing Principles for 6G: Secure, Open & Resilient by Design, THE WHITE HOUSE (Feb. 26, 2024), <https://www.whitehouse.gov/briefing-room/statements-releases/2024/02/26/joint-statement-endorsing-principles-for-6g-secure-open-and-resilient-by-design/>; *see also* Joint Statement Endorsing Principles for 6G: *SECURE, OPEN & RESILIENT BY DESIGN*, NTIA (Feb. 26, 2024, 12:00 PM), <https://www.ntia.gov/spechttestimony/2024/joint-statement-endorsing-principles-6g-secure-open-resilient-design>.

policy issues,⁹ agreed: “Historically, terrestrial mobile broadband networks primarily relied on licensed, exclusive spectrum. That has evolved over time as mobile, unlicensed, and shared access networking technologies began to converge. ... Using unlicensed and shared spectrum will play an important role, alongside exclusive licensed spectrum, to enable [performance intensive and immersive communications] use cases.”¹⁰

Shared and unlicensed networks already play a vital role in the spectrum landscape and demonstrate the value of investing in approaches beyond the traditional MNO model. They will be even more critical in the 6G era. Wi-Fi, for example, is an extremely powerful tool for advancing broadband, as it offers high performance, reliability, and security, with low barriers to entry, all while being built to share and to avoid harmful interference to other uses. With over 18 billion Wi-Fi devices deployed globally, Wi-Fi is now ubiquitous. Today, over half of all global internet traffic transits Wi-Fi, with even a majority of 5G traffic being offloaded to Wi-Fi. For example, as noted above, 88% of cable operators’ mobile-originated traffic is carried over Wi-Fi, and little reason exists to think that the large MNOs rely significantly less on Wi-Fi. Wi-Fi’s importance will continue to grow over time: Most wireless traffic growth is projected to come from indoor use, and Wi-Fi is expected to deliver the majority of that growth.¹¹ Studies of

⁹ See *Spectrum Management Advisory Committee*, NTIA, <https://www.ntia.gov/page/spectrum-management-advisory-committee> (last visited Aug. 7, 2024).

¹⁰ Commerce Spectrum Management Advisory Committee (CSMAC), *Final Report of Subcommittee on 6G*, at 21 (Dec. 2023), https://www.ntia.gov/sites/default/files/2023-12/6g_subcommittee_final_report.pdf (“CSMAC Report”).

¹¹ See PWC, *Perspectives from the Global Telecom Outlook 2023-2027*, at 5 (2023), <https://www.pwc.com/gx/en/industries/tmt/assets/pwc-gto-2023.pdf> (demonstrating the significant anticipated growth of Wi-Fi use).

human living and working patterns show that people are spending over 90% of the day indoors, and over 90% of professional activities occur indoors as well.¹²

Further, in just a few years since the FCC made the 6 GHz band available for unlicensed use, consumers have purchased several hundreds of millions of devices certified to use the band across three International Telecommunication Union regions, and the FCC continues to work to make additional use of the band possible. The newest Wi-Fi generations, Wi-Fi 6E and Wi-Fi 7, already make use of very advanced techniques to carry enormous amounts of data at high speed and low latency, such as wider channels, 4K QAM modulation, Multi-link operation and Multi Resource Units. NCTA members are actively deploying Wi-Fi 6E devices and plan to begin shipping Wi-Fi 7 devices to customers in early 2025.

Likewise, in the CBRS band, the innovative spectrum sharing approach has enabled significant growth in diversity of users in the band.¹³ Entities—including school districts, school campuses, cities, Tribes, warehouses, factories, farms, office buildings, and libraries—have relied on the CBRS band to increase broadband access and overall connectivity, including communities that the traditional cellular network business model too often neglects. As the CSMAC found, “the CBRS framework has served to protect incumbents, diversify use of the

¹² Neil E. Klepeis, et al., *The National Human Activity Pattern Survey (NHAPS): A Resource for Assessing Exposure to Environmental Pollutants*, 11 J. EXPOSURE ANALYSIS & ENV'T EPIDEMIOLOGY 231 (2001); Jean M. Cox-Ganser & Paul K. Henneberger, *Occupations by Proximity and Indoor/Outdoor Work: Relevance to COVID-19 in All Workers and Black/Hispanic Workers*, 60 AM. J. PREVENTIVE MED. 621 (2021).

¹³ See *The Innovative Spectrum Sharing Framework Connecting Americans Across the Country*, NTIA (May 1, 2023), <https://www.ntia.gov/blog/2023/innovative-spectrum-sharing-framework-connecting-americans-across-country> (evaluating the CBRS band and conclusively stating, “it is working”).

band,” “promote efficient spectrum use,” and “enhance opportunities for private networks.”¹⁴ Indeed, the success of private wireless networks using CBRS spectrum—including for educational, healthcare, agricultural, and industrial purposes¹⁵—demonstrates the benefits and value of a shared-spectrum framework. Further, the vibrant market for CBRS services and devices continues to grow, with more than 40 manufacturers selling CBRS equipment,¹⁶ and nearly 400,000 broadband access points deployed nationwide.¹⁷ In addition, more than 650 authorized end-client devices and 1,000 different operators use the spectrum where freely available, catering to the diverse needs of various industries and users.¹⁸

In both the 6 GHz and CBRS band, these innovations and commercial successes have emerged even as policymakers pursued conservative approaches to protecting federal and commercial incumbents. Policymakers are rightly considering continued advances in both areas

¹⁴ Commerce Spectrum Management Advisory Committee (CSMAC), Report of Subcommittee on CBRS, at 8 (Dec. 2023), https://www.ntia.doc.gov/sites/default/files/2023-12/cbrs_subcommittee_final_report.pdf.

¹⁵ See, e.g., Ryan Garvin, *CBRS-Enabled Private LTE Networks: Reliable Internet & Remote Learning*, FEDERATED WIRELESS (Feb. 19, 2021), <https://www.federatedwireless.com/case-studies/reliable-internet-access-for-schools-and-remote-learning-with-cbrs-enabled-private-lte-networks/>; Linda Hardesty, *RF Connect Builds a Private CBRS Network for Covid Healthcare Tents*, FIERCE WIRELESS (May 1, 2020, 6:12 PM), <https://www.fiercewireless.com/wireless/rf-connect-builds-a-private-cbrs-network-for-covid-healthcare-tents>; *Farms of the Future, Made Possible with CBRS*, WIFIFORWARD (Aug. 12, 2022), <https://wififorward.org/news/farms-of-the-future-made-possible-with-cbrs/>; Martha DeGrasse, *Airspan and Foxconn Use LTE and CBRS to Operate Smart Factory*, FIERCE WIRELESS (Feb. 12, 2021, 4:27 PM), <https://www.fiercewireless.com/private-wireless/airspan-and-foxconn-use-lte-and-cbrs-to-operate-smart-factory>.

¹⁶ *CBRS: The Game Changing Wireless Technology Is Coming of Age*, ONGO ALLIANCE (Aug. 21, 2023), <https://ongoalliance.org/cbrs-the-game-changing-wireless-technology-is-coming-of-age/> (“OnGo Alliance Aug. 21, 2023 Report”).

¹⁷ *Announcing CBRS 2.0: The Next Generation of Spectrum Sharing with the U.S. Military*, NEW AMERICA, <https://www.newamerica.org/oti/events/announcing-cbrs-20/> (last visited Aug. 20, 2024).

¹⁸ See OnGo Alliance Aug. 21, 2023 Report.

to enable greater use, with even more benefits for consumers. These proven spectrum sharing approaches will open bands to new commercial operations without incurring exorbitant clearing costs or requiring federal incumbent operations to relocate. Moreover—unlike exclusive-use approaches—shared and unlicensed networks do not replace one use with another, but rather make spectrum accessible to a diverse set of users and new entrants and enable a broad range of new, innovative uses such as private wireless networks. In doing so, these networks maximize efficient use of spectrum by employing the latest generations of broadband and mobile technologies. As spectrum usage continues to increase and requires greater efficiency, effective commercial usage will rely on these techniques to support dense, powerful networks.

II. TO SUPPORT KEY USE CASES ANTICIPATED FOR 6G, NTIA SHOULD PROMOTE NEW DEVELOPMENTS IN TECHNOLOGIES THAT ENABLE UNLICENSED AND SHARED ACCESS.

The *Notice* seeks comment, in **Question 1**, on what “specific use cases” will benefit from 6G,¹⁹ how the U.S. Government can support them, and, in **Question 20(I)**, on what new technological developments should be explored to support 6G.²⁰ 6G can support “new use cases beyond enhanced mobile broadband” that “encompass applications in various types of environments, e.g., dense urban, suburban, rural, indoor, high-speed, etc.”²¹ As the CSMAC recognized, there is a long list of anticipated use cases for 6G, both “traditional” (such as streaming and backhaul) and “non-traditional” (such as environmental sensing and digital twins) that will require a mix of exclusive, shared, and unlicensed spectrum.²² NCTA members anticipate, for example, that 6G will be used for immersive experiences, including live, 3D, and

¹⁹ *Notice* ¶ 1.

²⁰ *Id.* ¶ 20(I).

²¹ CSMAC Report at 14.

²² *Id.* at 16-18.

interactive content delivery beyond what already is possible today. Those use cases have the potential to revolutionize education, entertainment, and much more.

To support these and other 6G use cases, federal 6G policy should build on a variety of developments already occurring in the areas of shared and unlicensed spectrum, and it should focus on advancing sharing and sensing technologies. Prior generations of cellular technology prioritized macro deployments to support wide area coverage necessary to enable mobility. As mobile technology evolves toward 5G Advanced and 6G, operators will need to densify their network deployments to enhance capacity to enable emerging use cases that demand increased throughput. (Indeed, as noted below, MNOs' lack of investment in network densification is a significant reason why many consumers have not seen the advancements touted when carriers began marketing 5G nearly ten years ago.) NTIA can support new 6G use cases by emphasizing local capacity augmentation, which is compatible with lower-power outdoor small cell and indoor unlicensed Wi-Fi deployments. Use cases of the future will require local, targeted deployments to increase mobile network speeds in homes and offices where users consume a majority of data. 6G deployments can economically and efficiently increase mobile capacity by leveraging micro and small cell deployments, which operate at lower power levels.²³ In fact, higher power levels and larger geographic license areas will make spectrum sharing and coexistence more challenging, which will undermine potential 6G use cases and ultimately competition.

To make the most of our investments in shared spectrum, we must not only make spectrum available, but also advance technologies and models to use shared bands as efficiently

²³ Agrim Gupta, et al., *Densify & Conquer: Densified, Smaller Base-Stations Can Conquer the Increasing Carbon Footprint Problem in NextG Wireless*, ARXIV (Mar. 20, 2024), <https://arxiv.org/html/2403.13611v1>.

as possible. The recent CBRS 2.0 framework, for example, demonstrates how advances in dynamic spectrum sharing will position the CBRS band to adopt 6G technologies, updating previous restrictions to allow greater utility while continuing to protect vital federal operations.²⁴ The updates will “equip CBRS to serve a total of about 240 million people nationwide without preemption by federal operations.”²⁵ More generally, NTIA should find the least restrictive coexistence mechanisms needed to protect incumbents rather than supporting overly complex or conservative coexistence approaches, which can delay access to new frequencies and slow innovation.

Relatedly, NTIA can also support new 6G use cases by advancing the National Spectrum Strategy’s efforts to establish improved spectrum planning, develop evidence-based national spectrum decision-making approaches, test and further develop dynamic spectrum sharing tools, and invest in research and development for spectrum sharing. For example, efforts to explore technology interoperability and increases in spectrum-efficiency are critical. As the FCC’s Technology Advisory Council recommends, NTIA should encourage public and private sector research and development to “increas[e] spectrum efficiency” and “[e]xplore technology interoperability and options to solve last mile, mid-haul and back-haul needs ... that may use spectrum in conjunction with technologies.”²⁶

²⁴ See *Next Steps for Innovative Spectrum Sharing: CBRS 2.0: The Next Generation of Spectrum Sharing with the U.S. Military*, Remarks of Sarah Morris, Deputy Assistant Secretary of Commerce for Communications and Information (Acting), NTIA, (June 18, 2024), <https://www.ntia.gov/speechtestimony/2024/next-steps-innovative-spectrum-sharing>.

²⁵ *Id.*

²⁶ See, e.g., FCC Technology Advisory Council, 6G Working Group Position Paper, at 14 (Aug. 17, 2023), https://www.fcc.gov/sites/default/files/Consolidated_6G_Paper_FCCTAC23_Final_for_Web.pdf (“FCC TAC 6G Report”).

NTIA should also promote the development of AI tools to advance spectrum-sharing and sensing technologies. As the CSMAC recognizes, “AI and machine learning (ML) will be integrated in the whole 6G architecture and are fused inside every protocol layer as well as computation architecture including virtual functions, network slices, edge/cloud, and network orchestration and management.”²⁷ Specifically, the integration of AI with 6G technology has the potential to advance spectrum sharing and sensing technologies by “dynamically allocat[ing] and adapt[ing] frequencies and resources.”²⁸ Indeed, the FCC has begun to look into the possibility of using AI and ML tools to manage transmissions and avoid harmful interference, in lieu of oversight from a central spectrum authority.²⁹

Further, NTIA can support the research and development of spectrum-sharing technologies for unlicensed use. As discussed above, Wi-Fi 6E and Wi-Fi 7 represent incredible advancements, and Wi-Fi 8 aims to deliver even greater throughput up to over 40 gigabits per second and lower latency through innovative modulation techniques and even larger channel sizes.³⁰ Given the vital role Wi-Fi plays for indoor connectivity in particular, 6G will require these and additional advancements to offload the traffic from licensed frequencies for enhanced low-latency applications.

Finally, NTIA should take proper account of where we are in the 5G and 6G cycles. According to the CSMAC, “2030 [is] often cited as a target” for 6G, and Phase 1 standardization

²⁷ CSMAC Report at 20.

²⁸ *Id.*

²⁹ *See generally Advancing Understanding of Non-Federal Spectrum Usage*, Notice of Inquiry, 38 FCC Rcd. 7216 (2023).

³⁰ *See* Sec. I, *supra*.

of 3GPP Release 20 is not expected until 2026.³¹ Early planning for 6G is a worthwhile exercise, but U.S. policymakers should invest in the current technologies and strategies that could spur innovation in 6G connectivity—and should not adopt policies with assumptions about what 6G will be this early in the process. The CSMAC notes that “currently equipment providers and researchers are driving the development of 6G visionary ideas on evolution of legacy as well as newly defined use cases.”³² NTIA and other policymakers should continue to monitor those developments and invest in tools that will build on the U.S. advantages in spectrum sharing.

It is critical, moreover, that 6G development avoid 5G development pitfalls. Unlike 4G, which was developed to address the shortcomings of 3G technologies, 5G promised new and unique use cases. Such uses required technology development, but much of that work was overtaken by MNOs’ focus on accumulating spectrum holdings. As a result, 5G development, deployment, and implementation have fallen short of expectations. As the CSMAC has noted, for example, millimeter-wave frequencies “were considered a new frontier in the run up to the development of 5G systems,” but deployments in those bands “have seen a much slower growth compared to lower frequencies.”³³ U.S. policymakers should not make this same mistake for 6G, and the best way to set 6G up for success is to ensure that 5G spectrum is fully used and deployed. The transition to 6G development should not follow artificial timelines, but rather focus on consumer need and how the networks should be converged to best meet it.

³¹ CSMAC Report at 5.

³² *Id.* at 54-55.

³³ *Id.* at 49.

III. PURSUIT OF A 6G VISION BEYOND TRADITIONAL MOBILE NETWORKS WILL BENEFIT AMERICAN COMPANIES AND PROMOTE U.S. LEADERSHIP GLOBALLY.

The *Notice* recognizes, in **Question 4**, that U.S. policy should promote the “success of U.S. companies in the global 6G market”³⁴ A 6G vision that prioritizes sharing and unlicensed spectrum access frameworks will best achieve that objective.

First, American companies lead the world in the unlicensed and shared-spectrum marketplaces, and we should consolidate that success moving forward. The United States paved the way in designing and deploying the multi-layer CBRS Federal and commercial sharing framework. As a result, American companies are world leaders in innovating with private networks and specialized technologies. Moreover, Wi-Fi, using unlicensed spectrum, is led by U.S. companies and is at the heart of U.S. technology leadership. The United States invented Wi-Fi and was the first country to designate spectrum bands for unlicensed sharing. American companies continue to dominate production of Wi-Fi chips and access points.³⁵ Further, Wi-Fi contributes enormously to the American economy: Wi-Fi adds approximately a trillion dollars to the U.S. economy annually, with projections for those economic contributions to reach \$1.58 trillion by 2025.³⁶ American innovators leverage unlicensed spectrum as a platform for new devices, applications, and services due to its ubiquity and low barriers to entry.

³⁴ *Notice* ¶ 4.

³⁵ See *Wi-Fi Chipset Market is Expected to Reach USD 27,183.7 Million by 2025 at 6.02% CAGR – Report by Market Research Future (MRF)*, GLOBENEWSWIRE (Aug. 30, 2021, 9:21 AM ET), <https://www.globenewswire.com/news-release/2021/08/30/2288362/0/en/Wi-Fi-Chipset-Market-is-Expected-to-Rreach-USD-27-183-7-Million-by-2025-at-6-02-CAGR-Report-by-Market-Research-Future-MRFR.html>.

³⁶ See Wi-Fi Alliance, *Global Economic Value of Wi-Fi 2021-2025*, at 11 (Sept. 2021) https://www.wi-fi.org/system/files/Global_Economic_Value_of_Wi-Fi_2021-2025_202109.pdf.

Second, promoting shared spectrum use will foster competition in the wireless and broadband marketplace. Shared-licensed frameworks enable new and innovative entrants to the marketplace and give consumers more options and better prices for connectivity. Today, Americans are increasingly concerned about the cost of mobile plans, with one in five stating in 2024 that they are looking to move away from the dominant cell phone carriers and to a carrier that offers more flexibility.³⁷ Prioritizing spectrum coexistence will help address this issue and expand competition in the wireless and broadband marketplace. For example, with over 16 million total mobile lines, NCTA's members are the fastest growing wireless providers in the country.³⁸ Further allocation of spectrum for Wi-Fi and other shared spectrum use will increase the cable industry's capacity to provide competitive wireless offerings.

In contrast, a 6G policy that focuses only on high-power, exclusive-licensed coverage networks and use cases undermines our global leadership role and supports China's wireless strategy, not America's. Today, China controls the global 5G network equipment market, and China promotes high-power, exclusive-licensed networks around the world to advance the interests of its domestic suppliers. In doing so, the Chinese government seeks to block the advancement of unlicensed and shared-licensed technologies—thereby harming American companies that lead both markets—in order to maximize global market share for Chinese government-sponsored companies, such as Huawei and ZTE. Yet even Huawei admits that over

³⁷ See Max McCaskill, *Americans Waste \$1,500/Year on Cell Phones. How Much Are You Overpaying?*, WHISTLEOUT (June, 10, 2024), <https://www.whistleout.com/CellPhones/Guides/mobile-overspending-report>.

³⁸ See, e.g., *Spectrum Mobile Ranked #1 in Customer Service by J.D. Power*, CHARTER COMMUNICATIONS (Feb. 27, 2024), <https://corporate.charter.com/newsroom/spectrum-mobile-ranked-first-in-customer-service-2024>; *supra* note 3.

80% of mobile-originated traffic is carried over Wi-Fi—not licensed spectrum.³⁹ This undermines U.S. leadership and the ability of American companies, including chip and equipment makers, to compete. To counter China’s efforts, the United States must support the development and expansion of technologies, led by Wi-Fi and spectrum sharing, where it has a competitive advantage at home and abroad. This approach is consistent with President Biden’s directive in the *Executive Order on Promoting Competition in the American Economy*, which found that “the answer to the rising power of foreign monopolies,” like China, is “the promotion of competition and innovation by firms small and large, at home and worldwide.”⁴⁰

Finally, to promote spectrum sharing and unlicensed technologies, NTIA should take steps to promote 6G standards development beyond licensing standards focused on exclusive network models, to ensure a 6G vision that prioritizes sharing and unlicensed spectrum access frameworks and promotes innovation, instead of cementing incumbent carriers’ legacy business model. To this end, NTIA should support the work of a range of standards development organizations—not only 3GPP, but also IEEE, WinnForum, and other organizations.

³⁹ See *What Is 802.11ax (Wi-Fi 6)*, HUAWEI, <https://support.huawei.com/enterprise/en/doc/EDOC1100102755> (last updated Mar. 18, 2024).

⁴⁰ See President Joseph R. Biden, Jr., *Executive Order on Promoting Competition in the American Economy*, THE WHITE HOUSE, § 1 (July 9, 2021), <https://www.whitehouse.gov/briefing-room/presidential-actions/2021/07/09/executive-order-on-promoting-competition-in-the-american-economy/>.

CONCLUSION

NTIA has taken an important step with this *Notice* to ensure that U.S. policies facilitate the advancement of 6G technology. To deliver ubiquitous connectivity and to support key use cases, 6G must be more than a traditional mobile network. It must be a heterogeneous network environment—combining unlicensed, shared, and exclusive-licensed networks—to deliver enormous amounts of data with high throughput and low latency where consumers, businesses, and others most depend on wireless technologies, through the kinds of networks that best meet their needs. U.S. policymakers seeking to further 6G must therefore support new technological developments that enable unlicensed and shared access. NCTA stands ready to work with NTIA and its Federal partners on ways to carry out this vision of 6G and ensure that the Nation’s 6G strategy benefits American companies and promotes U.S. leadership globally.

Respectfully submitted,

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