August 21, 2024

The Honorable Alan Davidson
Assistant Secretary for Communications and Technology
National Telecommunications and Information Administration
1401 Constitution Avenue, N.W.
Washington, D.C. 20230

Dear Administrator Davidson,

Spectrum for the Future (SFTF) greatly appreciates the opportunity to provide input to the National Telecommunications and Information Administration (NTIA) on the state of development of sixth-generation (6G) wireless communications technology and how the Executive Branch should approach this standard.

SFTF represents a diverse coalition of innovators, anchor institutions, and technology companies using shared and locally licensed spectrum to build America's future technology leadership, industrial might, and global competitiveness.
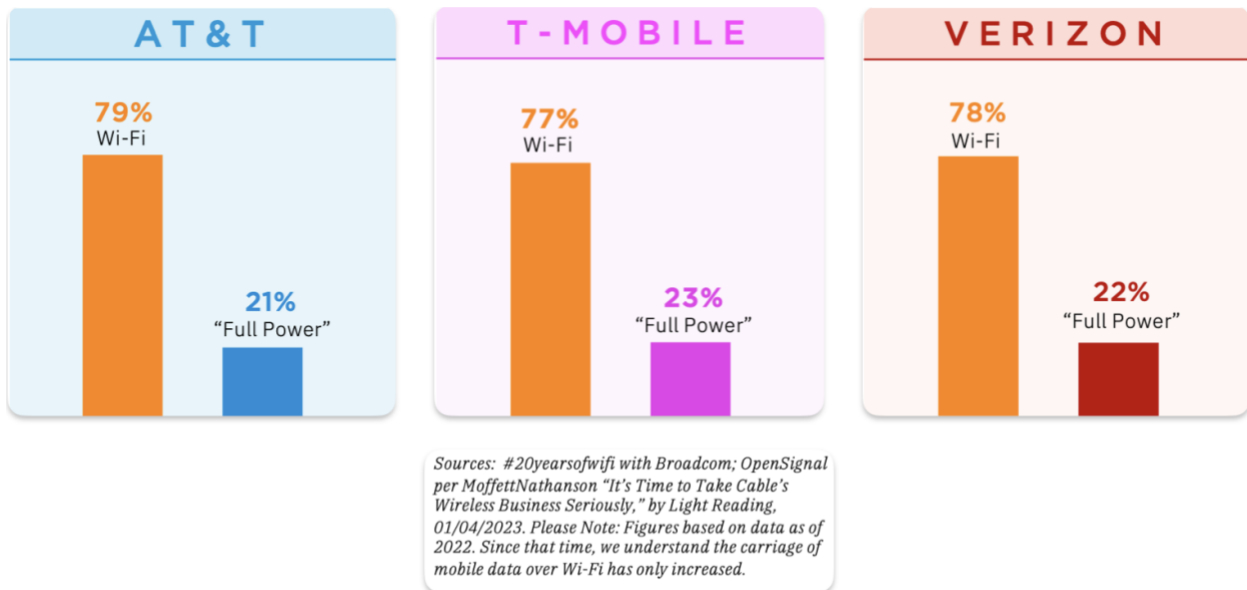
As the wireless landscape evolves, it is critical that spectrum policies support innovation, competition, and a diversity of use cases, from rural broadband to cutting-edge industrial applications. By promoting shared spectrum access, SFTF aims to ensure that spectrum resources are used efficiently and equitably across both federal and non-federal users, driving economic growth and technological advancement across all sectors of society. To best aid NTIA, this submission outlines several recommendations for how NTIA can approach 6G when the standard takes shape.

1. NTIA should prioritize societally beneficial uses of wireless technology through spectrum sharing, rather than focusing on a specific standard.

NTIA needs to approach the 6G ecosystem by looking beyond a single standard with a single deployment strategy. Prior generations of services have been locked in to a single and inflexible high-powered exclusive licensing approach. However, the reality of spectrum use and availability today, as well as in the future, compels spectrum policy to broaden its focus and embrace other coexistence standards and spectrum frameworks, like spectrum sharing. By focusing on sharing in a 6G ecosystem that includes multiple innovative services, without having to rely on hollow predictions about what a single 6G use case may or may not yield, NTIA can promote achievable gains in spectrum sharing and further the United States leadership in spectrum technology and policy.

SFTF applauds the broader focus on dynamic spectrum sharing in the National Spectrum R&D Plan and the National Spectrum Strategy, but we urge the Administration to go further. This includes expeditiously making new shared spectrum allocations available without delay, including the lower 3 GHz and 37 GHz bands. The aperture of those efforts is more appropriately suited to supporting resilient and competitive next-generation services as neither the Plan nor Strategy purports to be focused narrowly on a single standard. NTIA has been wise not to put all its eggs in a single basket, as it is increasingly clear that mass-market Mobile Network Operators heavily rely on other technologies, including Wi-Fi and CBRS, every day, including when their mobile services fail. The future policy surrounding 6G needs to reflect this reality – the future of spectrum policy is "shared."

Percentage of Mobile Traffic Handled by Wi-Fi versus Full Power

Sources: #20yearsofwifi with Broadcom; OpenSignal per MoffettNathanson "It's Time to Take Cable's Wireless Business Seriously," by Light Reading, 01/04/2023. Please Note: Figures based on data as of 2022. Since that time, we understand the carriage of mobile data over Wi-Fi has only increased.

What's more, other competitors rely heavily on those other technologies to bring lower-priced, more consumer-friendly service offerings to the fore. Like its predecessors, 6G networks will form only one part of a resilient and competitive wireless ecosystem.

2. To make 6G a commercial success, we must ground it in the reality of dynamic spectrum sharing.

The Administration's Joint Statement Endorsing Principles for 6G is a valuable guidepost for NTIA as it considers the role of 6G. In the statement, the Administration emphasizes the necessity of designing 6G technologies that incorporate spectrum-sharing mechanisms to coexist with incumbent uses while using spectrum efficiently.

Shared spectrum is uniquely necessary for the practical deployment of 6G and other critical technologies, particularly for innovative use cases such as private networks and Industry 4.0 applications. Unlike high powered exclusively licensed spectrum, which is increasingly difficult to make available and is often only utilized by a limited number of players, shared spectrum allows for more users and efficiency, greater availability and flexibility while ensuring reliability and performance.

With no usable "greenfield" spectrum available, the efficient use of existing spectrum is paramount. CBRS is an example of this efficiency. Under that rubric, private networks, quasi-unlicensed generalized access services, and Federal radar systems all coexist in the same band. CBRS, and the recent successful development and deployments of CBRS 2.0, provide a blueprint for future spectrum policy. Shared spectrum regimes ensure that critical national security needs are met by maintaining sufficient spectrum for incumbent federal users while also enabling and promoting commercial innovation. CBRS has successfully demonstrated that sharing models enable ongoing improvements and refinements based on real-world data, offering greater flexibility and adaptability than more rigid exclusive licensing regimes.

As we move toward next-generation wireless standards, including 6G, it is crucial that spectrum policy continues to evolve in a way that embraces the proven sharing regimes that can support powerful, diverse use cases while still protecting critical government use of the airwaves.

A few such use cases and successful examples of spectrum sharing are particularly worth highlighting as NTIA looks forward to setting 6G up for success.

Manufacturing: Ericsson 5G Smart Factory (Lewisville, TX)

Ericsson's USA 5G Smart Factory is leveraging CBRS spectrum to enable cutting edge manufacturing of 5G and Advanced Antenna System (AAS) radios. The 300,000-square-foot facility is "not only a manufacturing site but also a place of innovation." Over the past year, Ericsson has explored an impressive 25 new uses, including a telecom-grade wireless network using CBRS shared spectrum to provide fast and secure cellular connectivity for Industry 4.0. The factory has created 500+ new jobs that are fueling 5G infrastructure deployment across the country.

Military: US Marine Corps Logistics Base (Albany, GA)

CBRS enables real-time control of robotics, helps personnel manage critical assets and inventory, and enables authorities to utilize smart security cameras to authenticate personnel and track vehicle arrivals and departures.

"Achieving a pre-production, state-of-the-art private 5G network built solely by U.S.-based companies is an important milestone in advancing U.S. 5G competitiveness and gives the U.S. Military a key strategic advantage that can be replicated across

mission-critical DoD facilities to accelerate warfighter readiness." – Dr. Thomas Rondeau, Principal Director for FutureG & 5G, U.S. Department of Defense

"By bringing together senior federal officials with U.S.-based global technology leaders, we are arming our warfighters with the most advanced logistical solutioning for all branches of the military while bringing 5G manufacturing back to U.S. soil and positioning the U.S. at the forefront of 5G technology leadership." – Iyad Tarazi, CEO, Federated Wireless

Sports: The NFL (30 Stadiums across 24 States)

When a stadium is packed to the brim with thousands of fans, reliable connectivity is critical, which is why the NFL is using CBRS at all 30 of its stadiums across 24 states – enabling time-sensitive voice communications during the game, backstage communication during broadcasting, and on-field video monitoring.

Manufacturing: BMW Uses 5G Shared Spectrum (Spartanburg, SC)

BMW made a significant technological leap in introducing a private 5G wireless network (powered by CBRS) at their Spartanburg, SC, manufacturing facility that is aimed at streamlining manufacturing and storage activities, ensuring a seamless operational flow.

Agriculture: Hurst Greenery – The Farm of the Future (Westboro, MO)

In the small town of Westboro, Missouri, Hurst Greenery utilizes CBRS to connect its 18 greenhouses across 600 acres of land. Starting in 2020, Hurst Greenery's digital transformation quickly exceeded expectations. They've implemented precision agriculture tactics, like automated temperature and soil moisture monitoring, leading to a 10% increase in efficiency and profit.

3. The wireless ecosystem is bigger than the uses of the "big three" national mobile network operators, even with respect to what will be 6G.

The examples above demonstrate that 6G extends far beyond the traditional cellular networks operated by the three dominant major mobile network operators (MNOs). The Federal Government should exercise caution when evaluating hyperbolic claims made by certain mobile network operators regarding the potential transformative nature of 6G. The business model or deployment strategies of the big three carriers should not define and limit the development of 6G, rather policies and the vision for 6G should include a wide range of stakeholders, ensuring that the full potential of 6G is realized across different industries and use cases.

5G technology has not lived up to its initial promise for consumers, mainly due to slower-than-expected speeds and coverage issues. The rollout of 5G has been complicated by a combination of issues, primarily the reliance on existing 4G infrastructure in many cases, which has limited the potential speed and capability gains that were initially advertised. With respect to the big three major U.S. wireless companies' infrastructure, it is far less built out than other global contemporaries. The U.S. has 30 base stations per 100,000 people compared to the European Union with 57 and China with 132. Users in the U.S. have found that their 5G experience is no faster than 4G—a significant letdown given the hype surrounding the technology.

The current experience with 5G offers valuable lessons. While the IMT-2020 standard envisioned a broad array of capabilities—including enhanced Mobile Broadband (eMBB), ultra-reliable low-latency communication (URLLC), and massive Machine Type Communications (mMTC)—the actual deployment by MNOs has largely focused on enhanced Mobile Broadband. Meanwhile, industrial use cases, particularly those involving private 5G networks, have driven the adoption of URLLC, often without direct involvement from traditional wireless carriers. This divergence highlights the importance of fostering a 6G ecosystem that supports innovation across a wide range of applications.

Moreover, there is a persistent misconception that large MNOs require exclusive access to vast amounts of spectrum to meet growing demand. In fact, these providers themselves have made quite clear that they have more than enough spectrum.


"Do we have the best spectrum position in the market? We do... **we have almost unlimited spectrum.**"
Sowmyanarayan Sampath
Verizon Consumer Group CEO
May 2024

"We've got **tons of capacity that we have not yet rolled out...**"
Mike Sievert
T-Mobile CEO
2Q 2023

"We have quite a lot left of spectrum... **We bought spectrum for decades...**"
Hans Vestberg
Verizon CEO
April 2024

What's more, the use of shared spectrum has demonstrated that these needs can be met effectively without exclusive allocations. The value and important role for shared spectrum is even recognized by the legacy mobile network operators, as AT&T has successfully deployed private networks using CBRS to support Industry 4.0 applications. Additionally, AT&T has integrated CBRS with Wi-Fi networks at major facilities, such as the Dallas/Fort Worth International Airport, to offload mobile traffic, further illustrating the versatility of shared spectrum approaches. Verizon won 557 CBRS licenses at a cost of nearly $1.9 billion.

4. NTIA should prioritize spectrum sharing research in 6G development but should not overlook the critical technologies that are already available.

NTIA should prioritize spectrum sharing research as a cornerstone of 6G development. Spectrum sharing not only maximizes the efficient use of available (and scarce) frequencies but also supports a diverse array of applications, from industrial IoT to public safety communications.

As a foundational step, it is essential that NTIA's contributions to, and support of, 6G research accurately encompass dynamic spectrum sharing (DSS) as it is commonly understood within the industry. Specifically, DSS should refer to the simultaneous sharing of identical frequency ranges within a given geography by distinct services, rather than merely dividing frequency ranges between federal and non-federal users or sharing among multiple users of the same service.

NTIA should build upon the existing frameworks and successes of Spectrum Access Systems in the Citizens Broadband Radio Service, the Automated Frequency Coordinators in the 6 GHz band, and the PATHSS process outcomes. NTIA should continue to refine and improve the environment for shared licensed services, as it has recently done with the release of CBRS 2.0. While the rollout of CBRS 2.0 has largely *flown under the radar*, its release is significant since CBRS 2.0 will extend the benefits of shared spectrum to 72 million more consumers.

Credit: OnGo Alliance
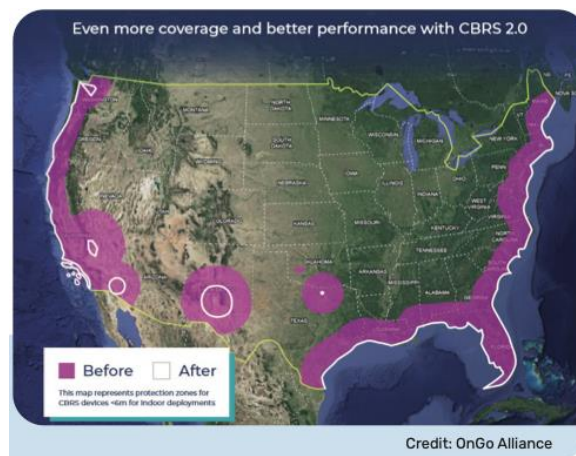
CBRS 2.0 is a critical development, and efforts like it should continue as a primary mechanism for NTIA to support and expand wireless technology for the benefit of the American people.

As NTIA moves forward, it should leverage the technologies and methodologies developed through such frameworks as foundational building blocks for future 6G spectrum bands. These new bands will likely involve different and evolving interference scenarios, necessitating advanced coexistence techniques that prioritize collaboration between federal and non-federal users.

The federal government, through NTIA with its unique understanding of federal systems, is well-positioned to contribute to this research. At the same time, non-federal users have developed a range of coexistence strategies, such as contention-based protocols, dynamic database management, and emissions masks. NTIA's work should explore how these non-federal strategies can be adapted for use in federal and non-federal sharing contexts, and consider the development and deployment of entirely new frameworks that facilitate multiple, diverse non-federal or commercial uses maximizing the efficiency of 6G networks will require a focus on local licensing through smaller geographic license areas and the use of lower power levels. These strategies help reduce interference and enable more granular control of spectrum resources. Local licensing enables tailored solutions that meet the specific needs of communities and industries, promoting innovation and competition by making it more economical and practical for more users to control and use spectrum resources. Lower power levels extend the useful range of these frequencies while minimizing the potential for interference, thus enhancing the overall performance and reliability of 6G networks.

5. NTIA Must Work Closely with U.S. Allies, Especially Other NATO Countries, On Wireless Standards Like 6G

As with any prominent wireless communications technology, it is imperative that the United States leads in the development of 6G standards along with like-minded allies. NTIA should advocate for standards that reflect the spectrum assets of countries with similar governmental uses, leveraging the U.S.'s comparative advantage in spectrum sharing. This U.S. led approach to coexistence can and must stand in opposition to the command-and-control approach pushed by the Chinese Communist Party on the global stage. This leadership will require collaboration between government agencies, industry stakeholders, and international partners to establish a robust standard that is based on a common understanding of the primary uses of 6G and an alignment with respect to the spectrum that will be available for 6G use.

For example, government uses of spectrum will be more closely aligned among NATO nations that use similar defense-related equipment. As a result, developing standards with such nations will more likely be reflective of the spectrum usage realities of the United States. What's more, without proper coordination, the 6G standard could inadvertently target spectrum that is currently used by sensitive federal or national security uses in the

U.S. and abroad. If the standard is not focused on coexistence with existing national security uses, it could undermine the geopolitical readiness of the U.S. and our allies. Harmonizing non-governmental uses with allied nations, on the other hand, is a win-win in that it will maintain current geopolitical readiness, not undermine the readiness of allied nations, and support the largest possible global market for new innovative companies within allied nations.

Productively, the Biden Administration has already outlined this approach as part of the 6G Principles. That document brought together governments of the United States, Australia, Canada, the Czech Republic, Finland, France, Japan, the Republic of Korea, Sweden, and the United Kingdom to focus, in part, on how sharing should be a central tenet of 6G moving forward. That must be emphasized further and kept at the center.

6. NTIA Must Encourage and Promote Diverse Participation in 6G Development

NTIA should encourage a broad range of stakeholders to participate in 6G development, extending beyond traditional wireless carriers. This includes technology companies, academic institutions, manufacturing companies and public sector organizations, all of which have valuable perspectives and expertise to contribute. Public-private collaboration will be crucial in addressing the safety, security, and environmental concerns associated with 6G. The development of secure and sustainable 6G networks will require input and cooperation from a wide range of stakeholders. By fostering these collaborations, the U.S. can ensure that 6G networks are not only cutting-edge, secure, resilient, and environmentally responsible, but actually deliver on the promise of any new such wireless standards.

For all those reasons, Spectrum for the Future and its broad membership welcome the opportunity to collaborate further with respect to how the Administration should contemplate its role in future wireless technologies, including 6G, and look forward to the work ahead.

Sincerely,
Spectrum for the Future