

**OVERVIEW**

WifiForward appreciates the opportunity to respond to the National Telecommunications and Information Administration (NTIA) request for Comment (RFC) on the development of a National Spectrum Strategy.

WifiForward is a broad coalition of companies, organizations and public institutions supporting unlicensed and shared spectrum. As NTIA seeks to identify 1,500 MHz of spectrum for more intensive use in increasingly crowded spectrum bands, WifiForward urges NTIA to take a balanced, all-of-the-above approach. Specifically, WifiForward supports:

- protecting and strengthening existing unlicensed spectrum designations,
- creating new shared-licensed bands to promote innovation and competition,
- freeing up new spectrum for unlicensed and shared-licensed use at a variety of frequencies including low, medium and high-frequency bands, and
- adopting investment-friendly, transparent, predictable unlicensed and shared-licensed rules that encourage growth and deployment.

Advances in technology enable us to establish spectrum policy not through antiquated, incumbent approaches, but on dynamic, future-forward applications that facilitate rapid innovation and wider use of our nation's airwaves. WifiForward stands ready to work with NTIA to ensure that the National Spectrum Strategy prioritizes innovation and enables all types of users to access spectrum.

**PILLAR #1****A Spectrum Pipeline to Ensure U.S. Leadership in Spectrum-Based Technologies****Factors for consideration and the value of unlicensed and shared spectrum (Questions 4 & 7)**

As NTIA works to identify a pipeline of spectrum and develops a National Spectrum Strategy, it should consider the needs of all users, both now and in the future. The innovation our country needs to make the most of spectrum moving forward will require shared licensing and unlicensed spectrum. Unlicensed spectrum offers low barriers to entry for innovators, enables easy access for consumers, and supports the Wi-Fi connections over which most internet data travels. Shared-licensed spectrum supports competitive wireless networks and other innovative and diverse uses, while also allowing multiple types of users to coexist. While WifiForward recognizes the role that exclusive licensing plays in a balanced spectrum policy, an over-reliance on exclusive licensing serves the deployment decisions and business models of only a small group of large, nationwide carriers.

## Unlicensed Spectrum

Thirty years ago, the Federal Communications Commission (FCC) allowed innovators to experiment in certain frequencies without individual licenses. The FCC's vision ultimately led to the development of Wi-Fi, which grew into a necessity for accessing the internet at home, in the office, in libraries and other community anchors and in countless other locations.

Consider just a few examples of how unlicensed access has improved our lives:

- Robust Wi-Fi has made it possible for high-speed wireline broadband networks to reach more and more devices in our homes and workplaces. Whether we are working from home or on the go, streaming video on smart televisions or tablets, or connecting with family and friends, it is almost certain that our wireless devices are using Wi-Fi. In fact, more than 80% of mobile traffic today is transmitted over Wi-Fi, as consumers increasingly use Wi-Fi to connect when and where they need to most.
- Wi-Fi and other unlicensed technologies like Bluetooth allow “Internet of Things” devices to communicate with users and with each other. Home speaker assistants, baby monitors, cars, home security systems and other appliances are now “smart”—and all rely on unlicensed spectrum.
- Wi-Fi is open to anyone and everyone with a connected device. If there is a Wi-Fi network available, the internet is accessible. Wi-Fi is thus critical for bridging the digital divide and the homework gap—public Wi-Fi networks are available at many schools, libraries, malls, cafes, and even on school buses.
- Wi-Fi is also critical to the success of licensed mobile networks. Cellular operators offload enormous amounts of traffic to Wi-Fi and other unlicensed networks, improving the performance and capacity of their own services. 5G services and other wireless services to the home rely on Wi-Fi to connect the home's many devices to those networks.

Unlicensed spectrum is open to anyone who follows the rules set out by the FCC and is thus a breeding ground for innovative new technologies. Additionally, as NTIA disburses billions of dollars in funding for broadband deployment, bringing the internet to some of the farthest reaches of the country, it is critical to acknowledge that most consumers access broadband via a Wi-Fi connection. Without robust Wi-Fi capabilities, all of the work currently going into the deployment of broadband and increasing broadband speeds would be wasted.

As NTIA considers new spectrum for the pipeline, the agency should remember how thirty years ago the FCC turned underutilized spectrum in the 2.4 GHz and 5 GHz bands into a true American success story. What more awaits when we open new unlicensed bands?

## Shared Spectrum

Technology now allows for multiple services to share the same spectrum, without harmful interference, making more intensive use possible while enabling coexistence between federal and non-federal users. As spectrum resources become scarcer, with greenfield spectrum today almost nonexistent, shared spectrum models are vital for introducing new commercial uses alongside important government systems and longstanding commercial incumbent operations.

They also enable the US government to open critical spectrum resources for commercial use without incurring the significant delays, costs, and burdens of clearing and attempting to relocate existing operations.

Spectrum can be shared through a variety of mechanisms. Databases and sophisticated sensing technologies enable multiple users and varying technologies and services to access spectrum dynamically. Licensing decisions and technical rules can also promote spectrum sharing, with smaller license areas and lower power limits allowing more efficient sharing and a greater variety of deployment models than would be possible with only high power levels covering large license areas.

In addition to facilitating coexistence, shared licenses also promote competition. Smaller license areas may be a better fit for a greater variety of providers and thus more accessible for companies beyond the largest cellular carriers. Greater competition in this space ultimately leads to better consumer prices and services, as well as new, innovative technologies that will benefit all consumers.

## Current and future unlicensed needs (Questions 1 & 2)

### Short- and medium-term needs

Without question, the variety and intensity of wireless services and applications using unlicensed spectrum will continue to grow. The spectrum available to support those services needs to grow alongside them. Likewise, broadband networks are getting faster, and consumer devices are using more data and demanding lower latency.

From a technological standpoint, future generations of Wi-Fi will require more contiguous spectrum and wider channels, to power the multiplying number of IoT devices and increasingly data-intensive applications that American consumers, businesses, healthcare providers, schools, and other industries rely upon for connected learning, telemedicine, smart cities, teleworking, and other Augmented-, Virtual-, and Mixed Reality (AR, VR and XR) applications. The newly available 6 GHz band has created the first-ever 160 MHz-wide channels to enable multi-gigabit Wi-Fi speeds. These wider channels brought the latest generation of Wi-Fi, Wi-Fi 6E, to Americans.

In order to innovate for use cases of the future, the next generations of Wi-Fi will need even wider bands to meet those demands. International standards bodies are already standardizing 320 MHz-wide channels to power the next generation of Wi-Fi, Wi-Fi 7, and enable faster speeds and higher capacity. The 6 GHz band was the first new unlicensed midband in more than a decade, and while it is a critical new resource, it alone will not address consumer Wi-Fi demand. When looking to the next generation of Wi-Fi and beyond, the 7 GHz band is crucial to keep pace with America's connectivity needs and continue US leadership in unlicensed innovation.

Mobile carriers argue that more spectrum is needed for exclusive licensing, rather than for unlicensed use, to continue American 5G growth. 5G growth is important—but cannot be successful without Wi-Fi, which carries the vast majority of wireless traffic. Because Americans rely on Wi-Fi more than any other wireless technology to connect, it must be given sufficient

spectrum resources to allow innovators to stay ahead of consumer and industry connectivity needs. Those in favor of exclusive licensing erroneously state that there is seven times more spectrum available for unlicensed use than for exclusive licensing. This assertion ignores the majority of already auctioned licensed spectrum and, more fundamentally, comparing licensed to unlicensed spectrum is like comparing apples to oranges. 1 MHz of licensed spectrum is not equal to 1 MHz of unlicensed spectrum, and most unlicensed bands require sharing: 5.1 GHz shares with satellites, 5.3 GHz with the government, 5.9 GHz with DoD, and 6 GHz with microwave towers and broadcasters. As NTIA considers these needs and identifies new bands to add to the pipeline, it should not be distracted by artificial and misleading MHz-to-MHz comparisons, but instead should ensure that there is spectrum available to support how consumers and businesses use spectrum. (See *appendix*)

### **Longer-term needs**

Unlicensed bands are called “innovation bands” for a reason. The underutilized spectrum that was released by the FCC thirty years ago eventually led to Wi-Fi and Bluetooth, which then enabled countless new technologies. We must consider future innovation in any National Spectrum Strategy.

New applications on the horizon, advanced telemedicine, immersive learning and training, radar, and other AR, VR and XR applications, will need multiple wide channels to deliver on their promise. And more spectrum available for unlicensed use will continue America’s leadership in promoting laboratories of innovation where anyone can experiment and create the next new application that benefits us all. NTIA should ensure that the spectrum pipeline opens up new frequencies for unlicensed use to sustain technologies like Wi-Fi into the future.

### **Spectrum sharing successes and future models (Question 8)**

As the FCC and NTIA continue to work together to manage commercial and federal uses of spectrum, they must continue to be innovative in how they balance stakeholder interests and government needs. Spectrum sharing has seen great success, providing American consumers and businesses with more spectrum while not burdening the federal government with having to vacate a band.

We have already seen success in a short time in the Citizens Broadband Radio Service (CBRS) band, the 150 MHz band of spectrum between 3.55-3.7 GHz. The CBRS band employs a three-tier spectrum sharing regime, in which government users have the highest priority, priority access licensees from auctions are next in line, and general authorized access users can use frequencies not in use by those other users, with much lower barriers to entry than in exclusive licensed spectrum. We are already seeing important and highly varied deployments in the CBRS band, resulting in increased access and connectivity in education, health care, agriculture, manufacturing, public safety and the military:

- Memorial Health System Clinic in Springfield, Illinois uses the CBRS band to connect outdoor hotspots to indoor networks, enabling nurses to test and triage patients outside the hospital. Hospitals also use the CBRS band for asset tracking, critical communications and patient monitoring.

- John Deere uses CBRS access in Iowa and Illinois for private company networks in manufacturing facilities, replacing outdated ethernet networks with completely wireless technologies that better track data and outputs.

Opening additional spectrum for shared use is an efficient way to deliver access to underserved and unserved populations while maintaining critical governmental access to those bands. With shared spectrum licensed in smaller areas, more companies have access to the spectrum in the areas they need, allowing service to consumers and businesses not currently served by large carriers. The spectrum needed to support all communities already exists—we just need to implement recent advancements in sharing technologies to ensure all Americans can benefit from it.

# CBRS Across the U.S.

In January 2020, the FCC authorized full commercial deployment in the 3.5 GHz Citizens Broadband Radio Service (CBRS) band — creating a sharing model that powers innovation.



Source: <https://wiforward.org/wp-content/uploads/2022/10/CBRS-Deployment-1-Page.pdf>

The nationwide carriers that dominate exclusive licensed spectrum have questioned shared spectrum regimes, like the CBRS band, because they do not get high power, exclusive access to that spectrum. But high power, exclusive licenses only support one business model—that of traditional cellular carriers. Technology and spectrum use cases are changing, and we cannot continue to rely on traditional ways of licensing and using spectrum if we want to support growing spectrum needs.

5G allows much faster speeds and lower latency. It is not needed for texting or browsing on your mobile phone. But it will be used in new, advanced applications that will be necessary to the success of US industry. Exclusive, high-powered spectrum dominated by three companies is not necessary for the private networks needed to support industrial automation, artificial intelligence, and predictive maintenance, in environments ranging from warehouses, ports, factories, airports, and office buildings, in rural as well as densely populated areas. To continue to lead the world in industries of all kinds, these businesses need access to spectrum to develop flexible, advanced solutions to industry-specific needs. Off-the-shelf solutions cannot support these advanced and diverse needs.

The CBRS model is one that strikes a balance between government, wireless and other consumer interests. Each service tier has a set of rules users must abide by, but the U.S. government is able to maintain the spectrum necessary to carry out critical national security operations, and when the U.S. government is not utilizing that spectrum, U.S. consumers are able to reap the benefits.

### **Unlicensed spectrum is an American success story (Question 9)**

The U.S. was the first country in the world to create an unlicensed band. That forward-looking decision created what is now a true American success story. U.S.-based companies are the leaders in Wi-Fi chipsets and devices. American consumers rely on unlicensed technologies more than consumers in other countries. And competition and free market innovation are at the heart of America's economic successes, and unlicensed spectrum's rules embody that. Wi-Fi's success also exemplifies how low barriers to entry and light-touch regulations enable new entrants, competition and innovation to flourish.

More Wi-Fi spectrum is essential for the United States to maintain its status as a global leader in spectrum policy, and continue to promote competition and innovation through a free market. Countries like China oppose creating new unlicensed bands and strongly support a system dominated by exclusive licensed spectrum as this best supports state-controlled companies around the world. We will not beat China by following China's spectrum playbook. An innovative, free market country like the United States should adopt a comprehensive spectrum policy that plays to our strengths by also supporting unlicensed and shared licensed approaches—not over-relying on exclusive licensing and stifling the competition and technological development we need to maintain U.S. leadership.

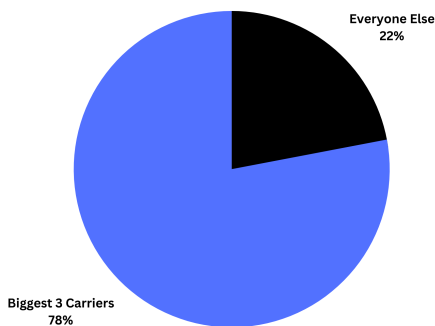
**PILLAR #2**

## Long-Term Spectrum Planning

### Fair spectrum allocation—innovation over exclusive auctions (Questions 1 & 3)

The exclusive licensing model of spectrum allocation in the United States favors traditional cellular carriers over innovators. As NTIA considers how to best engage with stakeholders in spectrum planning, both the NTIA and the FCC must support approaches that provide a real opportunity for all commercial users and consumers who need access to spectrum — which means a comprehensive spectrum strategy, not defaulting to exclusive licensing.

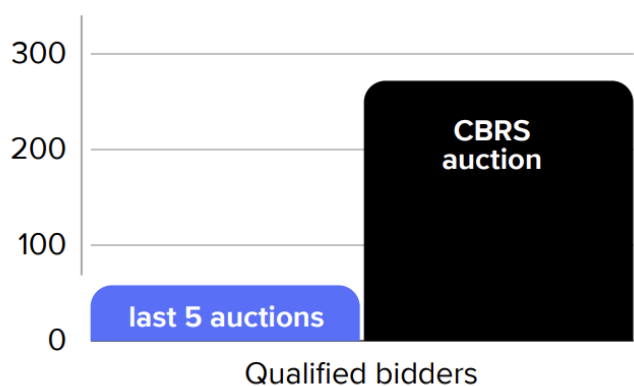
**Share of Exclusive Spectrum Licenses**



Exclusively licensed, high-power spectrum with large geographic license areas favors incumbents. This exclusive licensing model inhibits innovation and competition by creating high barriers to entry, and making it infeasible for anyone but incumbents to participate. In many cases, the geographic scope of each exclusive auction becomes so wide that it is only feasible for traditional cellular companies to participate, as it blocks new entrants from the playing field with business plans that focus on smaller areas.

Auction revenue is not the most important economic contribution of spectrum to the country and should not drive spectrum policy. For example, Wi-Fi is hugely valuable to the United States economy. Wi-Fi contributes hundreds of billions of dollars annually to the US economy, and in 2021 alone, boosted the U.S. economy by \$995 billion. The economic value of the recently allocated unlicensed spectrum in the 5.9 GHz and 6 GHz bands alone is expected to reach at least \$183.44 billion between 2020 and 2025. (See *appendix*)

Furthermore, spectrum sharing models like the CBRS band offer a solution that generates auction revenue while also supporting competition—offering smaller carriers the opportunity to participate in an auction process they would normally be unable to afford. Smaller licenses and lower power on shared bands like CBRS increase competition and make shared models ideal avenues for new commercial services. The CBRS auction had far more qualified bidders than the previous five exclusive licensing auctions—a clear sign that a shared model is vastly more accessible to a wider swath of participants. Additionally, a shared model makes it easier to make the spectrum available quickly, bypassing the complex, cumbersome, and time-intensive process of relocating





incumbent users. As NTIA seeks to include more stakeholders in spectrum policy, shared licensing is an excellent solution.

### Specific bands for consideration (Question 6)

WifiForward recommends NTIA focus on the following bands as it seeks to make more spectrum commercially available:

- 3.1-3.45 GHz band: Following the success of CBRS in the 3.5 GHz band, a similar sharing approach has the potential to produce the most value for federal incumbents and consumers in the 3.1-3.45 GHz band. A sharing model in this band provides an excellent alternative to forcing federal operations to relocate, and sharing will drive innovation and competition in connectivity to the benefit of American consumers.
- 6 GHz band: The allocation of the 6 GHz band for unlicensed use has already begun to provide innumerable benefits to Americans through more connectivity, faster speeds, lower latency and greater innovation for the future of Wi-Fi technology. However, the FCC's rules only allow for low-power access points (like a router), meaning that one router may not cover the entire range of a house. There are also rules limiting mobile and outdoor use of this band. While we understand NTIA does not have jurisdiction over these rules, WifiForward supports allowing higher-power access points in indoor settings and expanding the outdoor and mobile unlicensed uses of the band by permitting a Very Low Power device class.
- 7 GHz band: The next-generation Wi-Fi 7 standard will introduce 320-MHz channels (already being standardized internationally) to power the growing number of devices, deliver even faster speeds, and support the increasingly data-intensive telemedicine, telework, digital learning, AR, VR and XR applications. Those channels will require more spectrum than currently available in 6 GHz to meet these demands. An unlicensed approach (and potentially shared licensed use) would allow government users to stay in place and avoid exorbitant clearing and equipment costs, while also facilitating rapid commercial and consumer access to critically needed spectrum and supporting expansive US economic growth.

## CONCLUSION

WifiForward applauds NTIA's goal to identify spectrum for more intensive commercial use as part of the National Spectrum Strategy. Our nation's economic growth depends on a balanced approach that recognizes the value of all users—not just the business models that depend on exclusive licenses. We look forward to working together with NTIA on this essential mission.

## APPENDIX





Administrator Alan Davidson  
National Telecommunications & Information Administration  
U.S. Department of Commerce  
1401 Constitution Ave., N.W.  
Washington, D.C. 20230

Dear Administrator Davidson,

As NTIA works to develop a National Spectrum Strategy, the undersigned 15 public interest organizations and industry leaders urge NTIA to expand access to spectrum for commercial use through a balanced variety of approaches that will promote competition and innovation.

While our organizations represent a wide variety of perspectives, we all recognize the value of models supporting shared use, either through unlicensed use or licensed use that is dynamically shared on a priority basis. While exclusive-licensing plays a role in a balanced spectrum policy, an over-reliance on it serves the deployment decisions and business models of a small group of large, nationwide carriers. The innovation our country needs to make the most of spectrum moving forward will also require shared licensing and unlicensed spectrum. Unlicensed spectrum offers low barriers to entry for innovators, enables easy access for consumers and supports the Wi-Fi connections over which most internet data travels. Shared-licensed spectrum supports competitive wireless networks and other innovative and diverse uses, while also allowing multiple types of users to coexist.

As NTIA seeks to identify 1500 MHz of spectrum for more intensive use in increasingly crowded spectrum bands, these approaches will play an important role in the Nation's wireless and competitive future. We urge NTIA to take a balanced approach to the spectrum pipeline and overall National Spectrum Strategy by promoting unlicensed and shared-licensed use. To that end, we wish to briefly highlight the value of those approaches for consumers and the National economy:

### **The Value of Unlicensed Spectrum**

Thirty years ago, the FCC took so-called "junk bands" and allowed innovators to experiment in the spectrum without individual licenses. The FCC's vision ultimately led to the development of Wi-Fi, which grew from a curiosity to a necessity for accessing the internet at home, in the office, in libraries and other community anchors, and countless other locations.

Consider just a few examples of how unlicensed access has improved our lives:

- Robust Wi-Fi has made it possible for high-speed wireline broadband networks to reach more and more devices in our homes and workplaces. Whether we are working from

home or on the go, streaming video on smart televisions or tablets or connecting with family and friends, it is almost certain that our wireless devices are using Wi-Fi.

- Wi-Fi and other unlicensed technologies like Bluetooth allow “Internet of Things” devices to communicate with users and each other. Home speaker assistants, baby monitors, car keys and even coffee machines and other appliances are now “smart” – and all rely on unlicensed spectrum.
- Wi-Fi is open to anyone and everyone with a connected device, without a subscription. If there is a Wi-Fi network available, the internet is accessible. Wi-Fi is thus critical for bridging the digital divide and the homework gap—public Wi-Fi networks are available at many schools, libraries, malls, cafes and even on school buses.
- Wi-Fi is also critical to the success of licensed mobile networks. Cellular operators offload enormous amounts of traffic to Wi-Fi and other unlicensed networks, improving the performance and capacity of their own services. 5G services and other wireless service to the home rely on Wi-Fi to connect the home’s many devices to those networks.

Wi-Fi is a true American success story: It was developed in the United States, and U.S. companies continue to lead the charge for new and better Wi-Fi applications and access. Wi-Fi is also an important contributor to the national economy. In fact, it is estimated that Wi-Fi boosted the U.S. economy by \$995 billion in 2021, and the economic value of the recently allocated unlicensed spectrum in the 5.9 GHz and 6 GHz bands alone is expected to reach at least to \$183.44 billion between 2020 and 2025. As such, the National Spectrum Strategy should foster an area where the U.S. has a competitive and economic advantage.

Without question, the variety and intensity of wireless services and applications using unlicensed spectrum will continue to grow, and consequently, the spectrum available to support such services needs to grow alongside it. Broadband networks are getting faster, and consumer devices are consuming more data and demand lower latency. New applications on the horizon, like AR and VR, will need multiple wide channels to deliver on their promise. And more spectrum available for unlicensed use will continue America’s leadership in promoting laboratories of innovation where anyone can experiment and create the next new application that benefits us all. NTIA should ensure that the spectrum pipeline opens up new frequencies for unlicensed use to sustain technologies like Wi-Fi into the future.

### **Competition and Coexistence through Shared-Licensed Spectrum**

Exciting new technologies now allow for multiple services to share the same spectrum, making more intensive use possible while enabling coexistence between Federal and non-Federal users, as well as among non-Federal users. In an ever-more crowded spectrum environment, shared spectrum will be vital for introducing new commercial uses alongside important government systems and longstanding commercial incumbent operations.

Shared spectrum usually involves the introduction of new licensed services (and lightly licensed or unlicensed uses) alongside existing government or commercial operations and can be

achieved through a variety of mechanisms. Databases and sophisticated sensing technologies enable multiple users and varying technologies to access spectrum dynamically. Technical rules that create guardrails enabling unlike technologies to operate in the same band, such as indoor-use restrictions, also enable sharing. Licensing decisions and technical rules can also promote spectrum sharing, with smaller areas and lower powers allowing more efficient sharing than would be possible with high power levels covering large license areas.

In addition to facilitating coexistence, shared licenses also promote competition. Smaller licenses are more accessible for companies outside the large cellular carriers. Greater competition in this space ultimately leads to better consumer prices and services, as well as new, innovative technologies that will benefit us all.

We have already seen success in a short time in the Citizens Broadband Radio Service (CBRS) band, the 150 MHz band of spectrum between 3.55 - 3.7 GHz. The CBRS band employs a 3-tier spectrum sharing regime, in which government users have the highest priority, priority access licensees from auction are next in line, and general authorized access can use frequencies not in use by those other users, with much lower barriers to entry than in exclusive licensed spectrum. We are already seeing important and highly varied deployments in the CBRS band, resulting in increased broadband access and connectivity in education, health care, agriculture, manufacturing, public safety and the military:

- Memorial Health System Clinic in Springfield, Illinois, uses the CBRS band to connect outdoor hotspots to indoor networks, enabling nurses to test and triage patients outside the hospital. Hospitals also use the CBRS band for asset tracking, critical communications and patient monitoring.
- John Deere uses CBRS licenses in Iowa and Illinois for private company networks in manufacturing facilities, replacing outdated ethernet networks with completely wireless technologies that better track data and outputs.

### **Balance is Key**

We applaud NTIA's goal to identify spectrum for more intensive commercial use – our economic growth depends on spectrum. We urge NTIA to adopt a National Spectrum Strategy that supports innovation and competition through unlicensed and shared-licensed models.

Respectfully,

WifiForward

Comcast

Amazon

NCTA – The Internet & Television Association

Charter

Open Technology Institute

Wi-Fi Alliance

Public Knowledge

SHLB Coalition

CoSN - The Consortium for School Networking

Gigabit Libraries Network

American Libraries Association

Dynamic Spectrum Alliance

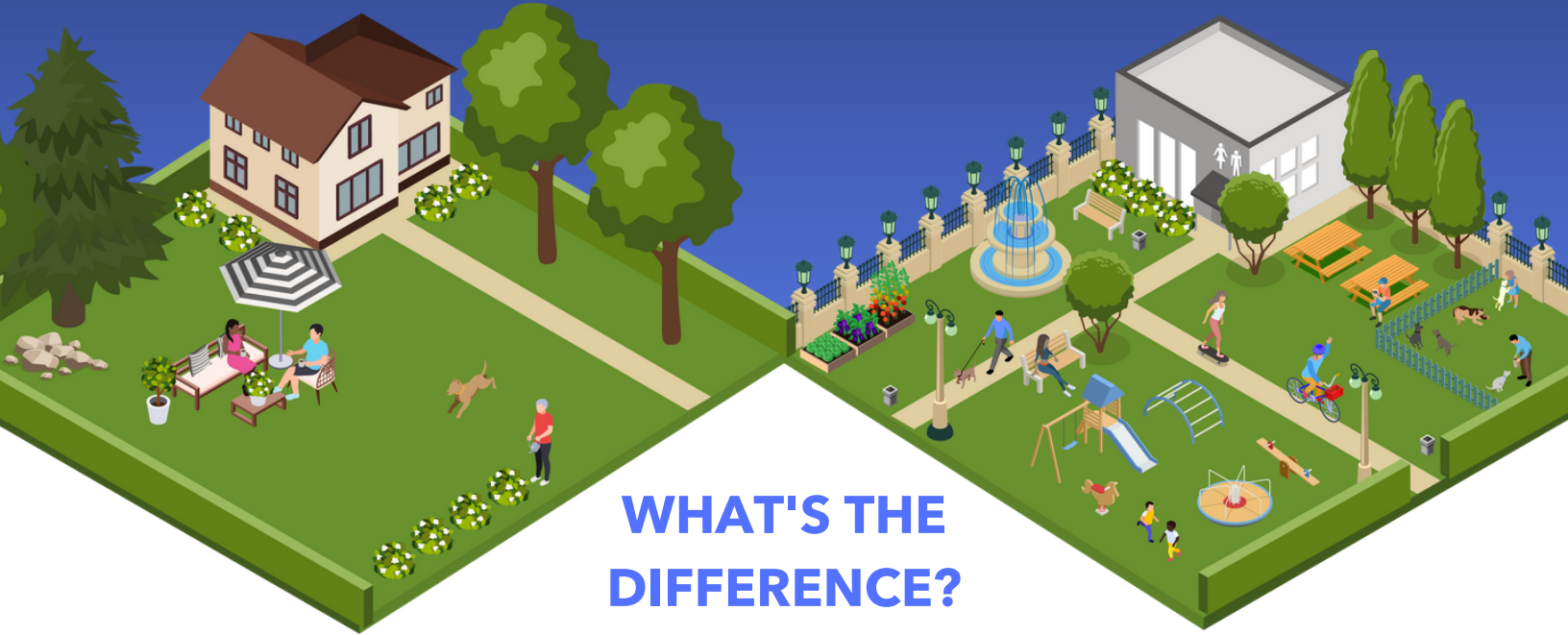
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Cox Communications

1 MHz of  
**LICENSED**  
Spectrum



1 MHz of  
**UNLICENSED**  
Spectrum



## WHAT'S THE DIFFERENCE?

### LICENSED SPECTRUM

is like a private house with a yard. Homeowners buy the exclusive use of that space and can largely do whatever they want with it. Like that yard space, licensed spectrum is valuable to those that buy it because of its exclusivity.

But not everyone can afford a house with a yard and some don't need a yard. That's where unlicensed spectrum comes in — it provides a shared space for all kinds of users in the community, as long as they follow the rules

**MOST UNLICENSED BANDS REQUIRE SHARING.** For example, 5.1 GHz shares with satellites, 5.3 GHz with the government, 5.9 GHz with DoD and 6 GHz with microwave towers and broadcasters.

### UNLICENSED SPECTRUM

is like a public park. Some will likely find it less valuable than their own private yards. The park has rules that require sharing the space with others — but it still has immense value to the whole community, including homeowners.

While a private yard and a public park might be similar in size, their values are completely different. It's the same with unlicensed and licensed spectrum.

**You can't use a megahertz-to-megahertz comparison because it's apples and oranges. Unlicensed and licensed spectrum, while similar, address different uses and often different users and have different roles in meeting connectivity needs.**

# Wi-Fi: Billions for the Economy

Did you know that Wi-Fi boosted the U.S. economy by **\$995 billion in 2021?**

**\$995 billion**  
in 2021



## 542,000 U.S. jobs

Generated by the boost in manufacturers and service providers involved in the provision of Wi-Fi-enabled solutions.



## \$838.4 billion

The economic surplus associated with cellular operators offloading mobile traffic to Wi-Fi and increased speed and Wi-Fi access point capacity for consumers.

**+\$177 billion**  
more than originally estimated



COVID-19 made Wi-Fi and unlicensed spectrum even more important and economically significant: Wi-Fi's economic value exceeded estimates in 2021 by \$177 billion.



Wireless users in the U.S. increased their communications time spent connected to Wi-Fi by 4% compared to early 2020.

  
**\$1.58 trillion**  
by 2025

## What's next?

With more unlicensed spectrum available, we'll have:

- faster speeds,
- higher throughput
- and more innovative technologies to meet the needs of consumers and encourage innovation.



The economic value of use of just the 5.9 GHz and 6 GHz bands will amount at least to **\$183.44 billion between 2020 and 2025.**<sup>1</sup>

This means new use cases — industries we can't even yet imagine!

New technologies like AR and VR, which will heavily utilize those new spectrum bands, will yield a spillover contribution to the GDP equivalent to **\$25.78 billion between 2020 and 2025.**<sup>2</sup>

1, 2:  
<http://wififorward.org/wp-content/uploads/2020/04/5.9-6.0-FINAL-for-distribution.pdf>

All other numbers from:  
The Economic Value of Wi-Fi®: a global view (2021 – 2025),  
The Wi-Fi Alliance and Telecom Advisory Services

November 17, 2022

The Honorable Jessica Rosenworcel  
Chairwoman  
Federal Communications Commission  
45 L Street, NE  
Washington, D.C. 20230

The Honorable Alan Davidson  
Assistant Secretary and Administrator  
National Telecommunications and Information Administration  
1401 Constitution Avenue, NW  
Washington, D.C. 20230

Dear Chairwoman Rosenworcel and Administrator Davidson,

Wireless spectrum is essential to America's future technology leadership, industrial might, and global competitiveness. That's why a remarkably broad swath of companies and organizations – representing manufacturing, automotive, agriculture, energy, retail, commercial real estate, communications, media, and supply chain industries, as well as schools, libraries, and civil society groups – support an inclusive approach to spectrum policy. America needs a balanced policy that considers the needs of an extraordinarily diverse range of spectrum stakeholders who are investing in advanced networks to power the "5G economy".

As we consider new spectrum options that can be made available to serve the American people, we urge you to build on the demonstrated success of the Citizens Broadband Radio Service (CBRS) spectrum sharing model. The innovative CBRS licensing framework has driven innovation in the next generation of wireless networks. These networks advance investment, protect critical U.S. leadership and security by enabling ongoing Department of Defense (DoD) and Federal missions in shared bands, drive innovation and competition, and maximize efficient use of the limited yet essential spectrum resource. Every day, more devices, services, and organizations require access to a wider array of spectrum resources. Implementing approaches that promote a wide variety of advanced communications applications will powerfully advance the public good.

### **Spectrum Sharing Advances Investment**

The Federal Communications Commission (FCC) first authorized commercial equipment in the CBRS band just three years ago and completed its auction of shared licenses just two years ago. In that short timeframe, CBRS is now being used throughout the country with over 285,000 CBRS base station devices (CBSDs) already deployed in under three years. For comparison, the commercial wireless industry has built 418,887 cell sites *over its entire 40-year history*. (During the same three-year period that CBRS has been active, cellular providers built 69,543 [cell sites](#) – of which more than [10,000 use CBRS](#).) As further evidence of a dynamic equipment ecosystem, the FCC has certified 187 different CBRS base station models and 496 different end user client devices, ranging from traditional smartphones and IoT modules and gateways to security cameras, barcode scanners, and building management sensors. Use of the CBRS band is vibrant and growing at an impressive pace.

### **Spectrum Sharing Drives Innovation**

The CBRS framework provides users with flexibility to choose from the broadest range of technologies and service models, driving innovation and competition in the private wireless market. Because CBRS spectrum is accessible to a wide variety of operators, it provides options for operators in suburban, rural and remote areas



that are not adequately served by traditional carriers, while also enabling private network users to customize networks to meet their needs.

CBRS is emerging as the home spectrum band for a myriad of advanced wireless use cases. For example:

- CBRS-powered networks are improving the efficiency of supply chains, warehouses, and critical seaports.
- CBRS is enabling advanced manufacturing techniques that enhance worker productivity and safety, helping American firms maintain their competitive edge.
- Farms are using CBRS to increase efficiency, yields, and cost savings.
- Transportation and shipping hubs are using private networks to support automated-guided vehicles moving cargo and to improve real-time logistics through faster wireless communications.
- Schools and libraries are using CBRS to close the digital divide and homework gap for underserved communities.
- Hospitals are using CBRS to triage and monitor patients, including by connecting outdoor hotspots to indoor networks, so nurses can test and triage patients outside the hospital setting.
- Airports, entertainment venues, and stadiums are using private CBRS networks to improve the guest experience by providing additional and dedicated bandwidth for venue operations.

These and many other use cases demonstrate that CBRS networks – along with complementary technologies like industrial automation, artificial intelligence, precision agriculture, and edge computing providers – are essential to enabling an enterprise technology stack that propels American innovation and advanced industrial practices.

### **Spectrum Sharing Spurs Competition**

CBRS enables “converged” delivery models that both compete with and bolster traditional wireless network services provided over exclusively licensed spectrum. It is also proving complementary to Wi-Fi. No single private entity or industry should hold the key to an enterprise, university, or other entity’s ability to access the public airwaves needed to deploy an innovative, purpose-built network. The CBRS framework helps ensure that does not happen. This competition drives still more innovation, creating a virtuous cycle.

### **Spectrum Sharing Maximizes Efficiency of a Limited Resource**

CBRS uniquely combines auctioned and non-auctioned authorizations into a single frequency band, maximizing the scale of the equipment ecosystem to the benefit of many different types of users. The FCC conceived of the CBRS shared-license model to allow the DoD to avoid band clearing (and its associated costs) and continue its critical operations while also allowing a wide variety of commercial operators to use spectrum in the same band. This tiered spectrum sharing model ensures the protection of America’s national security interests while allowing other users to make the most of a critical resource.

Both the auctioned (Priority Access License, or PAL) and non-auctioned or licensed-by-rule (General Authorized Access, or GAA) portions of the CBRS bands have demonstrated substantial success. The PAL auction resulted in 228 diverse winning bidders – almost *10 times the number of winning bidders in the exclusive-use 3.45 GHz band*. PAL winners included wireless internet service providers and electric utilities, cable operators, and

nationwide and regional mobile network operators. The GAA portion of the band hosts nearly 900 different [users](#), including factories, cities, school districts, hospitals, research centers, schools, public libraries, utilities, and other critical infrastructure. Most importantly, unused PAL spectrum does not lie fallow, and can be efficiently put to use by GAA spectrum users.

That all of these different user types can “cohabitate” in a single spectrum band is an achievement to be celebrated and replicated. At the same time, as new technologies and techniques become available to make the CBRS automated dynamic sharing regime even more efficient, it provides a framework for iterative improvement over time.

### **Spectrum Sharing Is Internationally Recognized**

CBRS has become a model for spectrum sharing around the world. Recognizing the value of midband private 5G networks, other countries are also working to make spectrum available in new ways for new users and uses. For example, Germany, France, the United Kingdom, Japan, Brazil, Sweden, and other countries have all designated substantial amounts of shared midband spectrum for private and local networks.

- In [Germany](#), the [Frankfurt Airport](#) is working toward deploying a private 5G network to “control data and voice communication autonomously.”
- In Japan, [Sony](#) is working to deploy internet service that will minimize “service disruptions caused by heavy traffic” in certain residential complexes.
- In the U.K., [Verizon](#) is using shared midband spectrum to develop a private 5G wireless network for the Associated British Ports.
- In Europe, [CEPT](#) is studying CBRS-like dynamic sharing of low/medium power networks with satellite systems in the 3.8-4.2 GHz band.

With CBRS, the United States has shown the world that spectrum can be made available without requiring inefficient allocations for a wide variety of different uses. In light of other countries’ moves toward greater spectrum sharing, the United States should extend its leadership by nurturing and growing CBRS.

### **Conclusion**

The undersigned parties believe that the CBRS allocation has fulfilled its promise as the “innovation band” in an incredibly short period of time. The framework should be advanced for future spectrum allocations, including in the lower 3 GHz band, to enable greater competition, innovation, efficiency and American leadership. Thank you for continuing to support a spectrum policy that demonstrates America’s inventive spirit at its finest.

Sincerely,

Airspan Networks

American Library Association

Celona Inc.

Comcast Corporation

Deere & Company

Amazon.com Services LLC

CalChip Connect

Charter Communications, Inc.

Cox Communications, Inc.

Dynamic Spectrum Alliance

|                                                            |                                          |
|------------------------------------------------------------|------------------------------------------|
| Federated Wireless                                         | Hewlett Packard Enterprise Company (HPE) |
| HRMavenir Systems, Inc.                                    | JBG SMITH Properties                     |
| Midcontinent Communications                                | Motorola Solutions, Inc.                 |
| NCTA – The Internet & Television Association               | Open Technology Institute at New America |
| Pollen Mobile LLC                                          | Public Knowledge                         |
| Purdue Research Foundation                                 | Shure Incorporated                       |
| The Schools, Health & Libraries Broadband Coalition (SHLB) | US Ignite                                |
| Weavix                                                     | WISPA – Broadband Without Boundaries     |

CC: The Honorable Brendan Carr, Commissioner, Federal Communications Commission  
The Honorable Geoffrey Starks, Commissioner, Federal Communications Commission  
The Honorable Nathan Simington, Commissioner, Federal Communications Commission