WINNING IN WIRELESS

A Playbook to Secure the Future for Continued U.S. Wireless Leadership on the Global Stage

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Introduction

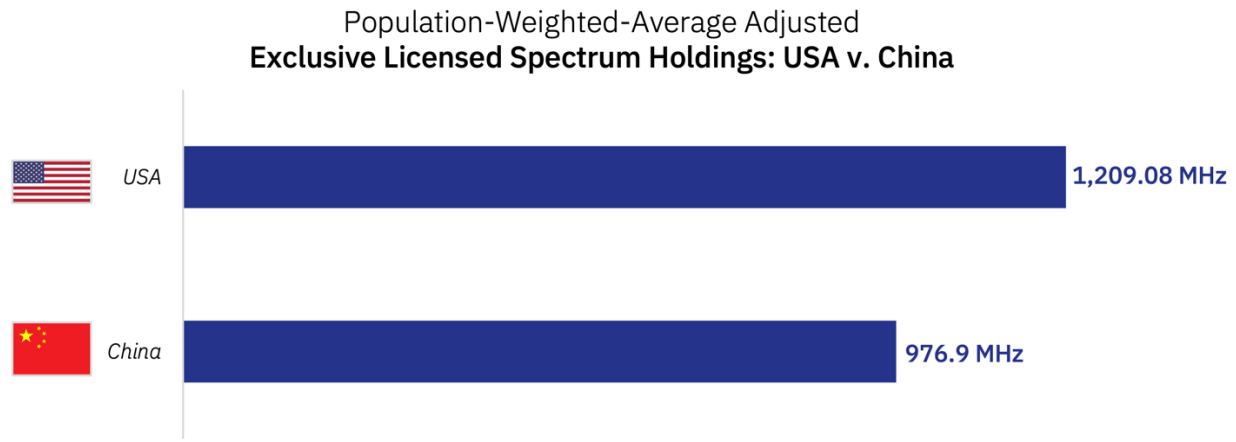
The most important question in spectrum policy today is: how can the U.S. maintain, and even accelerate, our global leadership in wireless? The answer is simple. Ensuring U.S. wireless leadership requires leveraging our greatest strengths – namely our unrivaled innovation and engineering capabilities – to get more usage out of finite spectrum resources. It also means finally tossing the outdated spectrum playbook of the 1900s out the hand-crank car window next to the Motorola Bag phone where it belongs. On that note, it's also time to move past the made-for-TV "race to 5G." To be clear, even measuring against 5G standards, and despite unfounded claims to the contrary, the U.S. is a global 5G leader today. But with the launch of 6G now months away, and multi-gigabit Wi-Fi 7 already delivering unmatched connectivity, the "race to 5G" is already over. And continued focus on the past will not position the U.S. to lead in wireless for years to come.

As the backbone of wireless communications, spectrum is a critical resource that needs to be managed efficiently using state-of-the-art, automated tools and techniques – capabilities developed in America by U.S. technology leaders. Moreover, access to spectrum cannot be guaranteed only for the nation's largest consumer-facing cellular networks, but also for the thousands of enterprises representing manufacturing, automotive, agriculture, energy, retail, commercial real estate, communications, media, and supply chain industries, as well as schools, libraries, and local governments. Only by ensuring spectrum is being used both efficiently and effectively can this limited natural resource support modern needs, which will only continue to increase. Smart allocation and management of spectrum can maximize efficient use, buoy both national and economic security, promote advanced American high-tech capabilities, and support a world-class, modernized U.S. and allied manufacturing and industrial base as well as the jobs and economic prosperity that come with them.

Sufficient 5G Spectrum Has Already Been Allocated and Auctioned

The U.S. leads the world in advanced wireless telecommunications technology, spectrum policy, and spectrum availability. As noted in the recent report "Implementing the National Spectrum Strategy," "[r]etaining U.S. leadership in next-generation technology and services will require the U.S. Government to reinforce principled, forward-looking national spectrum priorities. Over the past several decades, the U.S. has been the international leader by developing, in a bipartisan fashion, new spectrum policies to meet increasing commercial demand."[1]

Claims that America has fallen behind in allocating spectrum for 5G are wrong and misleading. Tech industry analyst Dean Bubley points out that "CTIA likes to claim that China has allocated much more midband spectrum than the US, but overlooks the fact that 3.3-3.4 GHz is dedicated for shared, indoor use by multiple MNOs, while 200MHz in the lower 6 GHz band is for localised enterprise private networks. It is also far from clear when and where the upper 6 GHz band might be used for 5G, or by which operators."[2] In fact, according to New Street Research, the U.S. has roughly the same amount of exclusive licensed spectrum to mobile network operators (MNOs)[3] when adjusted by population-weighted averages (Chinese MNO licensed holdings total 976.90 MHz, while U.S. MNO licensed holdings total 1209.08 MHz).[4]



[1] "Implementing the National Spectrum Strategy," Aspen Digital, a program of the Aspen Institute, September 2024. CC BY-NC. www.aspendigital.org/report/national-spectrum-strategy.

[2] "Comparisons of 5G sites & spectrum are overly politicised," Dean Bubley, April 2, 2024, https://www.linkedin.com/pulse/comparisons-5g-sites-spectrum-overly-politicised-dean-bubley-igrke/.

[3] In the U.S., the three largest MNOs are AT&T, T-Mobile, and Verizon Wireless.

[4] New Street Research: Global Spectrum Database, accessed 3/10/2025, used with permission.

While the U.S. has, in fact, allocated a significant amount of spectrum for mobile broadband services and auctioned nearly all of it for exclusive licensed use, the spectrum that has been licensed for 5G has not been fully utilized. U.S. carriers themselves acknowledge they have access to plenty of spectrum and that they haven't fully tapped into their reserves:

- Verizon's CEO recently stated, "I use a fraction of it [C-Band] today. Or not a fraction, but there's a lot left in the tank . . .. I'm probably using on average 80 MHz on the 160, mainly in big cities and now going suburban and rural."[5]
- Verizon's Consumer Group CEO also affirmed how "we have almost unlimited spectrum."[6]
- T-Mobile's situation is similar with their President of Technology explaining, "[w]e are only using 60% of our mid band spectrum on 5G today. Even though 80% of our devices are 5G capable."[7]

Other countries are in the same spot. The majority of European countries have licensed roughly the same amount of spectrum as the U.S. (in many cases less) especially in the 2.4 to 4.0 GHz range – the widely-accepted "sweet spot for 5G."[8] Yet, despite having access to sufficient – or even an abundance – of 5G-capable spectrum resources, international and domestic wireless telecom companies are struggling to monetize those spectrum assets, declaring bankruptcies and announcing layoffs.[9] Wireless telecom giants, including Nokia, Ericsson, Cisco, Telefonica, Telstra, and Vodafone, have had to reduce employee headcounts and operations due to a decline in demand for 5G equipment and a reduction in network infrastructure expenditures.[10] These layoffs show that the hype around 5G was just advertising dollars and that consumer uptake has been slow, resulting in significant spectrum investments being underutilized.

When compared to other countries across the globe, China's spectrum allocation situation is unique. While China and the U.S. have made comparable amounts of exclusive licensed spectrum (in number of megahertz) available to carriers, China has a far larger population – more than four times larger than the U.S. population – to serve with that bandwidth. And, though China claims to have made hundreds of megahertz available for exclusive licensed 5G mobile services, the reality is that a good portion of that mid-band spectrum is available only for low-power indoor operations. For example, 100 MHz of spectrum in the 3.3-3.4 GHz band has been assigned to two of China's mobile carriers. But that spectrum can only be used for low power, indoor operations given the Chinese government's ongoing incumbent use. Moreover, the band immediately adjacent, 3.1-3.3 GHz, is completely closed off from commercial use.[11]

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[5] https://broadbandbreakfast.com/verizon-ceo-says-company-has-room-to-grow-fixed-wireless/#:~:text=While%20Vestberg%20wasn't%20worried,low%20as%20$20%20per%20month.

[6] https://www.verizon.com/about/sites/default/files/2024-05/MN_Conference_Transcript_051424.pdf.

[7] https://www.lightreading.com/ai-machine-learning/t-mobile-uses-algorithmic-ai-to-guide-5g-expansion.

[8] See https://www.newstreetresearch.com/research/spectrumhub-call-slides/attachment.

[9] For example, see https://www.thestreet.com/technology/key-telecom-equipment-company-files-for-chapter-11-bankruptcy.

[10] See https://telecom.economictimes.indiatimes.com/news/industry/h1-2024-telecom-layoffs-continue-as-cisco-telefonica-telstra-vodafone-others-shrink-headcount/111080893 and https://www.capacitymedia.com/job-cuts-roundup.

[11] https://www.gsma.com/solutions-and-impact/technologies/networks/5g/china-issues-5g-spectrum-licences-for-indoor-coverage/#:~:text=The%20Chinese%20government%20has%20granted,and%20helping%20speed%20up%20rollouts.

Hong Kong's spectrum allocation situation is another interesting case. Hong Kong is the only country to have auctioned 6 GHz band spectrum for IMT (4G/5G/6G mobile use). After a brief 7-day auction, licenses in the 6 GHz band sold for only 5% above the already low reserve price (equivalent to $257k per MHz), and 25% of frequencies went unsold.[12] That auction showed low demand for additional high-power exclusive licensed spectrum, with a combination of the 6 GHz band being 2,000 MHz higher than the sweet spot range for 5G and the nonexistence of a spectrum shortage likely contributing significantly to the sluggishness of auction proceeds.

Bottom line: exclusive licensed spectrum amounts are not necessarily a trustworthy arbiter of who is "winning" the spectrum race. But even by that definition of success, the U.S. is in a solid position. However, to win the long game, America must ensure spectrum is managed efficiently. Spectrum policies should strive to increase the number of users that can access a band through advanced tools developed in the U.S. that can ensure both our government and our industrial base have sufficient access to spectrum to meet their communications needs.

[12] https://www.policytracker.com/hong-kong-raises-81-million-from-6-ghz-auction/.

Mobile Network Operators Do Not Need Additional Spectrum to Deploy 5G or 6G

Historically, growth of mobile wireless was dependent on access to low band spectrum that, due its propagation characteristics, was better suited for wide area coverage. A handful of companies were willing and able to invest in acquiring spectrum licenses and in deploying the infrastructure necessary to provide cellular coverage at affordable rates. Over the years, market consolidation led to three national, infrastructure-based mobile service providers that have expended significant capital to build out "nationwide," consumer-oriented cellular networks. However, expansion of coverage to new areas has slowed greatly.[13] This slowdown is not attributable to a lack of available spectrum, as some purport, but due to the fact that there is little to no return on investment to cover large portions of the country where very few people (or devices) are located.

Significantly, increasing capacity in high demand areas does not require more exclusive licensed spectrum for the nation's largest carriers, but it does require those carriers to increase their investments in network densification. In other words, use the spectrum they already have, but do it more efficiently and effectively. By building out small cells – a technical solution that wasn't available until fairly recently – network operators can improve coverage, capacity, speed, and performance more quickly and efficiently. Small cells cover shorter distances and use spectrum more effectively, while also enabling higher speeds, greater bandwidth, and lower latency. By serving smaller coverage areas located closer to subscribers, small cells can reuse the same frequencies more often, increasing network capacity without radical increases in spectrum allocation.

Proponents of exclusive licensed spectrum also claim they need more spectrum to roll out the latest generation of IMT technologies that are designed to utilize wide contiguous channels. What their arguments skip over, however, is that new generations of IMT technology are rarely, if ever, deployed initially in greenfield spectrum. Instead, existing licensed spectrum is "re-farmed" from an older, outdated technology and upgraded to the latest iteration of the IMT standard – a practice that should be encouraged to ensure spectrum usage is as efficient as possible. Furthermore, it is questionable whether wide, contiguous channels are even actually necessary to take advantage of these newer generation IMT technologies. Carrier aggregation of channels from multiple frequency bands allows the allocation of spectrum resources on a dynamic basis and enables the network to adapt to changing conditions and optimize performance.

Given that additional spectrum is not needed by the mobile carriers to increase coverage or meet capacity demands, U.S. policymakers should instead focus on how to ensure spectrum is being used

[13] "Closing the mobile coverage gap is not a technical challenge. It is primarily an economic challenge. Uncovered populations typically live in rural locations with low population densities, low per capita income levels and weak or non-existent enabling infrastructure such as electricity and high-capacity fixed communications networks. These characteristics have a profound adverse impact on all aspects the business case for mobile network expansion. The revenue opportunity for new base stations in rural or remote locations can be a much as ten times lower than in an equivalent site in an urban area. The operating costs can be as much as three times higher and the capital investment costs up to two times higher." GSMA, Unlocking Rural Coverage, https://www.gsma.com/solutions-and-impact/connectivity-for-good/mobile-for-development/wp-content/uploads/2016/07/Unlocking-Rural-Coverage-enablers-for-commercially-sustainable-mobile-network-expansion_English.pdf.

effectively and efficiently and on ensuring access to that spectrum is available to support a modern industrial base.

The U.S. Leads in Wireless Technology and Spectrum Management Innovation

To win the spectrum race over the long term, the U.S. should focus on its strengths, namely our high-tech capabilities and smart, efficient use of spectrum, while ensuring our military, government, and manufacturing and industrial base are able to take full advantage of advanced modern technologies designed here at home.

The U.S. is clearly the world leader in advanced wireless telecom software capabilities, including cloud-based dynamic spectrum management tools,[14] software defined radio (SDR), and Artificial Intelligence/Machine Learning (AI/ML) techniques. President Trump just announced a $500 billion investment in the "Stargate" venture to build AI datacenters in the U.S.[15] Together, these software capabilities - developed here in the U.S. - are used to optimize technical parameters to mitigate interference and maximize radio performance and are an essential component of Open RAN (O-RAN) technology – the foundation of the next generation of wireless telecom equipment. The sophisticated software that manages spectrum access and promotes effective and efficient spectrum usage is a capability we should be promoting and exporting globally in addition to using it at home to maximize spectrum for a variety of critical use cases.

Advances in AI/ML, SDR, and O-RAN benefit from access to spectrum resources that can be leveraged when and where needed to optimize network performance for particular use cases and applications. The U.S. has a big leg up on leveraging these technologies through our forward-looking spectrum policies that include licensing approaches providing a wider range of spectrum access options. For example, the Citizens Broadband Radio Service (CBRS) enables opportunistic access for users of IMT technologies, including national and regional mobile carriers as well as a host of industrial private wireless operators, without the need to acquire exclusive license rights.

The U.S. is also the leader in unlicensed technology, like Wi-Fi, which carries 85% of the world's internet traffic, including 90% of consumer mobile traffic. The economic value of Wi-Fi in the U.S. is expected to grow from $1.6 trillion to $2.4 trillion from 2024-2027.[16] Industry analysts correctly observe, "Wi-Fi technology has become indispensable in both consumer and business environments, powering everything from home Wi-Fi networks to large-scale enterprise solutions. As Wi-Fi routers and mesh systems continue to advance, they are shaping the future of wireless connectivity, particularly with the adoption of the Wi-Fi 6 standard."[17] And, unlike licensed technologies, such as 5G, which are currently dominated internationally by Chinese manufacturers (Huawei and ZTE), unlicensed Wi-Fi is dominated by American manufacturers. Wi-Fi chipset manufacturing is led by U.S. companies, including Qualcomm, Broadcom, Intel, and Texas Instruments, while Cisco, HPE Aruba, Extreme Networks, and Ruckus, are leading U.S. Wi-Fi equipment vendors. Thanks again to U.S. forward-thinking spectrum policy that made

[14] For example, the world's leading spectrum management capabilities known as the CBRS Spectrum Access System (SAS) and Automated Frequency Coordination (AFC) system have been developed by U.S. software as a service companies.

[15] https://www.foxnews.com/media/massive-ai-stargate-project-trump-admin-reveals-next-steps.

[16] https://wifinowglobal.com/news-blog/new-study-pegs-value-of-wi-fi-to-us2-4-trillion-in-2027-and-argues-for-more-wi-fi-spectrum-in-7-ghz-band/.

[17] https://www.mordorintelligence.com/industry-reports/wi-fi-market.

1200 MHz of 6 GHz band spectrum available for unlicensed technologies, these U.S. tech companies produced an estimated $870 billion in economic value just between 2023-2024, which is expected to increase to $1.2 trillion by 2027.[18] To maintain our leadership position in future generations of Wi-Fi technology and accommodate ever increasing Wi-Fi demand, U.S. policymakers should make additional spectrum available for unlicensed use in the adjacent 7 GHz band, which would generate a projected additional $79.62 billion between 2025-2027.[19]

By supporting U.S. technology companies that develop state-of-the-art wireless telecom software capabilities and dynamic spectrum sharing and management tools, as well as advanced wireless technologies, such as Wi-Fi 6 and Wi-Fi 7, U.S. policymakers will ensure America's leadership position in the global wireless race.

[18] TELECOM ADVISORY SERVICES, LLC, https://wififorward.org/wp-content/uploads/2024/09/Assessing-the-Economic-Value-of-Wi-Fi.pdf.

[19] Id.

Private Wireless Is Driving Innovation and Economic Growth

By their own admission, the national mobile network operators have sufficient spectrum resources to meet their 5G and presumably 6G needs, thanks in large part to the fact that the vast majority of U.S. mobile network traffic – both in and outside the home – is offloaded to unlicensed spectrum. U.S. policymakers should focus efforts on ensuring sufficient spectrum is available for other users and uses, including competitive wireless offerings, and thousands of enterprises representing manufacturing, defense, automotive, agriculture, energy, retail, commercial real estate, communications, media, and supply chain industries, as well as schools, libraries, and civil society groups.

Five years ago, commercial deployments in the CBRS band were launched, enabling hundreds of new advanced wireless networks to be deployed on "carrier-grade" spectrum by a wide range of users – including MNOs - without necessitating acquisition of an overly large license area via a competitive auction. The CBRS licensing framework, which includes both an auctioned/licensed component (Priority Licensed Access) and an opportunistic/licensed-by-rule component (General Authorized Access) was a truly novel and incredibly successful approach to spectrum policy and management. It solved the problem of enabling incumbent users to continue to access spectrum while maximizing efficient use of the band through the introduction of shared commercial operations. And it found a balance between increased access to spectrum and the coverage and deterministic benefits of more traditional licensed access.

The CBRS licensing "experiment" has been proven and is now producing material results. Having access to licensed-by-rule spectrum by diverse users is fueling a stronger economy as new wireless networks are being deployed across the country to support modern, high-tech manufacturing, logistics, and production facilities. In keeping with President Trump's mission to make America the manufacturing superpower of the world once again, the energy, mining, and manufacturing sectors are benefiting strongly from the deployment of private wireless networks on licensed-by-rule spectrum that are designed to meet their unique requirements and can be operated in a cost-efficient manner. Juniper Research forecasts the U.S. CBRS market will grow 280% and reach 66 million connections by 2028, driven predominantly by the energy, mining, and manufacturing sectors.[20] By accessing CBRS spectrum and deploying private networks, these companies reduce operating costs by avoiding expensive spectrum access fees or costly third-party connectivity services, increasing domestic energy production and unleashing U.S. energy independence.

Allowing companies to access spectrum directly provides them with advanced tools to customize solutions that meet their specific business objectives. A petrochemical manufacturer with facilities in western Texas does not have the same spectrum connectivity requirements as a port terminal operator in one of the country's largest cities. As such, off-the-shelf products from one of the big MNOs do not provide flexibility to meet the different spectrum needs of different enterprises. Just as private companies own land and design buildings that best meet their business needs, they should similarly have access to customizable spectrum. Shared licensing models, like CBRS, allow enterprises to access spectrum so that they can achieve their connectivity goals both efficiently and cost-effectively.

[20] https://www.juniperresearch.com/press/us-cbrs-market-to-be-driven-by-energy-mining-and-manufacturing-reaching-66-million-connections-by-2028/.

Examples of the myriad private wireless deployments that rely on CBRS shared spectrum access include:

Manufacturing

Leveraging American innovation and access to the shared CBRS band, manufacturers cross the country are developing more efficient plants, increasing worker safety, and boosting productivity:

- **Auto Manufacturing** | BMW's South Carolina facility is the company's largest global manufacturing hub, with a production rate exceeding 1,500 cars daily. To streamline manufacturing and ensuring a seamless operational flow, BMW deployed a CBRS-based private 5G wireless network at the facility.[21]
- **Agricultural Equipment Production** | John Deere has deployed private wireless networks at multiple facilities to connect computer vision gear and torque tools directly to CBRS radios.[22]

Energy & Utilities

Energy producers and utility companies are using the CBRS band to build private networks, leading to more efficient operations.

- **Chemical Production** | In only four months, Dow Chemical deployed CBRS at its Texas facility to update its operations and maintenance, boosting efficiency, worker safety, and productivity.[23]
- **Smart Grid** | In California, San Diego Gas & Electric deployed CBRS for metering, identifying faulted circuits, and disaster mitigation responses.[24]
- **Natural Gas** | Cameron LNG implemented a private network for industrial applications at its natural gas liquefaction plant in Louisiana.[25]
- **Petrochemicals** | Chevron utilizes its CBRS PAL licenses to deploy private wireless networks that monitor and manage industrial equipment, significantly improving safety and security. [26]

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[21] https://tecknexus.com/5gusecase/private-5g-manufacturing-bmw-spartanburg-facility/78/

[22] https://www.fierce-network.com/wireless/private-5g-will-be-standard-operating-procedure-john-deere.

[23] https://www.automation.com/en-us/articles/may-2023/dow-private-cellular-network-empowers-manufacturer.

[24] https://www.fierce-network.com/private-wireless/san-diego-gas-electric-starts-private-lte-build-using-cbrs-spectrum.

[25] https://cdn.osisoft.com/osi/presentations/2023-AVEVA-San-Francisco/UC23NA-2OGE02-CameronLNG-Field-Digitizing-LNG.pdf.

[26] https://www.fierce-network.com/private-wireless/cpchem-deploys-eight-private-lte-networks.

EOG Resources, Pioneer Natural Resources and Oxy (Occidental Petroleum Corporation) are also engaged in efforts to integrate LTE and 5G NR-based CBRS network equipment into their private communications systems.[27]

Military Operations

All branches of the U.S. military are actively investing in private wireless networks to support logistics, training, security, and mission critical operations.

- **U.S. Navy** | The Navy deployed a private 5G network at Whidbey Island Naval Air Station using the DISH Network's 600 MHz and CBRS spectrum. This network supports a wide array of applications for advanced base operations, equipment maintenance, and flight line management.[28]
- **U.S. Marine Corps Logistics Base** | The Marine Corps has deployed a private 5G network to modernize its largest logistics base improving operations with 98% accuracy in inventory reordering, 65% faster movement of goods, and a 55% reduction in labor costs.[29]
- **U.S. Air Force Research Lab** | As part of DoD's modernization efforts, JMA Wireless and RIVA Networks added private 5G capabilities at the Rome Research Site – the research organization for Command, Control, Communications, Computers, and Intelligence (C4I) and Cyber technologies.[30]

Enterprises

A wide range of enterprises are deploying private wireless networks to support operations, tenants, customers, etc.

- Purdue University operates a CBRS private wireless network for a 400-acre smart city, called Discovery Park, that includes manufacturing, retail, residential, professional offices and a micro-hospital.[31]

[27] https://www.rcrwireless.com/20230928/industry-4-0/spending-on-us-lte-5g-cbrs-networks-to-jump-20-per-year-to-hit-1-5bn-by-2027#:~:text=Oil%20%26%20Gas%20%7C,private%20communications%20systems.

[28] https://www.lightreading.com/open-ran/a-closer-look-at-the-dish-5g-satellite-effort-for-the-us-military.

[29] https://www.privatelteand5g.com/marine-corps-modernizes-logistics-with-private-5g-network-at-albany-base/.

[30] https://tecknexus.com/5gusecase/jma-wireless-riva-networks-to-deploy-private-5g-at-air-force-research-lab/43/.

[31] https://www.fierce-network.com/private-wireless/smart-city-microcosm-includes-cbrs-neutral-host-fiber-network.

- 345 Park Ave deployed a CBRS private wireless network for the commercial real estate property to improve security and visitor features.[32]
- National Landing developer, JBG Smith, deployed a 5G private wireless network using CBRS spectrum to support the office buildings, residential high-rises and retail tenants.[33]
- Port of Long Beach terminal operator, Maersk, operates a private CBRS network to more efficiently manage the nation's busiest port and connect IoT equipment for logistics.[34]
- American Dream Mall in NJ operates a CBRS private wireless network across the 3 million square foot entertainment venue to support parking, security, and future technologies without exhausting bandwidth for the millions of visitors that come to the mall.[35]

Farms

The CBRS band is being used to support private wireless networks to implement new agriculture technology to increase crop yields, efficiency, and cost savings.

- Hurst Greenery, located in Missouri, uses CBRS-enabled next-gen agriculture technology to equip farms with soil sensors and wearable technology for livestock, leading to a 10 percent increase in profits driven by improved yields and cost savings.[36]
- John Deere is using private wireless on CBRS spectrum not only in its tractor factories, but also on the tractors themselves to scan plants to determine appropriate levels of fertilizers and pesticides.[37]
- Intel and Blue White Robotics deployed a private wireless network to add intelligence to traditional farm equipment at a vineyard in California.[38]

[32] https://www.crowncastle.com/pdfs/the-rudin-family-345-park-cbrs-announcement.pdf.

[33] https://www.fierce-network.com/private-wireless/federated-builds-private-wireless-networks-national-landing-redevelopment.

[34] https://spectrumfuture.com/the-port-of-long-beach/.

[35] https://www.anscorporate.com/blog/ans-and-jma-wireless-spearhead-pioneering-commercial-cbrs-project.

[36] https://www.fierce-network.com/private-wireless/farmers-use-private-lte-cbrs-spectrum-to-increase-yields.

[37] https://wififorward.org/news/farms-of-the-future-made-possible-with-cbrs/.

[38] https://www.federatedwireless.com/news/blue-white-robotics-and-federated-wireless-collaborate-with-intel-to-chart-a-new-path-to-autonomous-agriculture-with-flexible-robotics-and-private-wireless/.

Transportation

Airports and ports across the country are deploying private wireless networks on CBRS spectrum to support smart operations.

- Dallas Love Field Airport operates a private wireless network with Boingo for streamlined airport operations.[39]
- Miami International Airport has deployed a private wireless network using CBRS spectrum that supports an omni-channel chatbot, IoT sensors for maintenance and congestion monitoring, and improved wireless services for tenants.[40]
- The Port of Oakland, CA uses CBRS for workflow analytics, environmental monitoring, smart gate management, and drone surveillance.[41]

Healthcare

CBRS spectrum is being used to increase the efficiency of healthcare operations at the busiest hospitals.

- Stanford Health Care is leveraging CBRS spectrum to develop and implement private wireless "express lanes" for quick triage and admission of patients.[42]
- City of Hope Hospital has deployed a private wireless network to support the cancer care operations of its medical staff.[43]

[39] https://www.globenewswire.com/news-release/2018/07/23/1540622/0/en/Boingo-Deploys-CBRS-at-Dallas-Love-Field-Airport.html.

[40] https://ongoalliance.org/resource/how-miami-international-airport-is-using-a-cbrs-private-network-to-transform-into-a-smart-connected-aviation-hub/.

[41] https://insidetowers.com/cell-tower-news-oaklands-maritime-port-sets-up-private-lte-network-using-cbrs/

[42] https://celona.io/community-stories/healthcare-private-lte-cbrs-wireless-celona.

[43] https://www.businesswire.com/news/home/20250122694015/en/LTE-5G-NR-Based-CBRS-Networks-Research-Report-2024-2030-Future-Roadmap-Business-Models-Standardization-Regulatory-Landscape-Case-Studies-Ecosystem-Player-Profiles-and-Strategies---ResearchAndMarkets.com.

Education

K12 schools and universities are deploying private wireless networks to support students on campus and in nearby communities to close the digital divide.

- Salt Lake City Murray City School District has deployed a wireless network using CBRS spectrum for students in grades K-12. [44]
- City of Tukwila operates a private wireless network on CBRS to enable students without home internet to access web-based learning from home using pre-provisioned Chromebooks. [45]
- Cal Poly deployed a private 5G network across its campus to improve campus operations, enhance core IT services across the campus, and increase collaboration with faculty and students on research and development.[46]

These examples of private wireless network deployments show how critical spectrum access is to America's economic future and how shared spectrum is empowering American businesses and fueling innovation. In fact, when it comes to private wireless leadership, it is increasingly clear that the U.S. is already way ahead. China recently acknowledged the importance of spectrum to support its industrial base in a call for "the orderly implementation" of "independent" 5G private network trials.[47] Under this directive, telcos and provincial governments were ordered to assist enterprises in obtaining spectrum for pilot networks. China's decision to make spectrum available for private network trials only underscores the importance of flexible spectrum access models first adopted by the U.S., such as the CBRS licensing framework that includes both licensed and license-by-rule (opportunistic) options. To ensure the U.S. remains the global business leader, these flexible models should be expanded to other frequency bands, including 3.1-3.45 GHz.

In addition to meeting private wireless connectivity needs, CBRS is being used by new entrants to the mobile marketplace, bringing competition and lower prices. For example, Charter Communications recently announced they are in the "full deployment phase" of their CBRS licenses.[48] They have deployed thousands of CBRS radios across North Carolina, Alabama, and Georgia, and this year will continue adding thousands of radios in those states and others. In 2026 and 2027, Charter has announced plans to accelerate deployment, adding tens of thousands of radios throughout the company's CBRS footprint. Comcast has had similar success with its mobile service offering. Since launching in 2017, Xfinity Mobile and Comcast

[44] https://inseego.com/resources/case-studies/murray-city-school-district-relies-on-inseego-to-support-its-evolution-to-5g/.

[45] https://www.federatedwireless.com/news/federated-wireless-and-city-of-tukwila-launch-innovative-cbrs-private-lte-network-for-student-learning/.

[46] https://ucm.calpoly.edu/news/cal-poly-innovation-capabilities-expand-new-5g-innovation-lab.

[47] https://www.lightreading.com/private-networks/china-edges-toward-private-5g-reform.

[48] https://www.lightreading.com/wireless/charter-reaches-full-deployment-phase-for-cbrs-ceo

Business Mobile have combined to add over 7.5 million lines, growing roughly 1 million subscribers per year.[49]

Charter's and Comcast's entrances into the mobile market have already benefited consumers with lower prices. For customers of the big MNOs, the typical two-line household is going to spend $150 to $180 per month for two unlimited lines. At both Charter and Comcast, the cost for two unlimited lines is $80 per month. As a result, a typical two-line household can save up to $1,200 per year.[50]

Shared spectrum has the potential to cement our place as a leader in wireless capability, innovation, and high-tech manufacturing. As one industry analyst noted, "[t]he U.S. has been a leader in developing and delivering innovative spectrum models, like those underpinning Wi-Fi and the Citizens Broadband Radio Service (CBRS), plus their technological enablers such as advanced sensing and databases. These shared-spectrum wireless systems produce tremendous economic value, democratize investment into new wireless solutions, and expand consumer and business access to high-speed and high-capacity connectivity. They also help mitigate the risks of state control and oligopolistic domination of wireless services."[51] Modern economic challenges depend on modern spectrum management practices that ensure spectrum is available whenever and wherever needed by U.S. companies and institutions.

[49] https://corporate.comcast.com/stories/xfinity-mobile-seven-million#:~:text=During%20the%20third%20quarter%20of,been%20great%20at%20reducing%20churn.

[50] https://spectrumfuture.com/wp-content/uploads/2025/04/Cable-Delivers-for-Mobile-Consumers.pdf

[51] https://www.fierce-network.com/broadband/spectrum-sharing-preparing-wrc-27.

Unlicensed Spectrum:
The Workhorse of the Wireless Industry

Wi-Fi, a technology that didn't even exist 30 years ago, has become essential part of everyday life for all Americans. Not only do consumers rely on it daily for basic communication, news, entertainment, etc., it has also enabled massive innovation and is responsible for the entire IoT (Internet of Things) movement. "Wireless internet service has changed the way people use the internet. Emergence of smartphones combined with WiFi penetration has brought a sea-change in the utilization of internet. To some extent, WiFi has been instrumental in the growth of data traffic as well. Its emergence has greatly benefited all of us."[52] Over its 27-year history, Wi-Fi has become the workhorse of the Internet, supporting 95% of all wireless devices, 85% of all internet traffic, and up to 90% of mobile traffic. Whether inside or outside the home, consumers now rely heavily on Wi-Fi for data usage, with 77-88% of screen-on time occurring through Wi-Fi connections.[53]

When first introduced, Wi-Fi technology only had access to the Industrial Scientific Medical (ISM) "junk bands" (900 MHz, 2.4 GHz, and 5.8 GHz), so named due to their widespread use by devices like microwave ovens, baby monitors, and garage door openers. Recognizing how important Wi-Fi is and how crowded the bands it relies upon have become, the FCC made a landmark decision to open the 6 GHz band for shared, unlicensed use. While this important decision opened 1200 MHz for low power unlicensed devices, the band is already occupied by hundreds of thousands of incumbent licensed systems whose operations take precedence and have protection rights from new users.

After the FCC's 6 GHz decision, proponents of exclusive licensed spectrum claim "too much" unlicensed spectrum has been made available at the expense of licensed users. But that claim is misleading to say the least. First, and most importantly, hundreds of megahertz in the 6 GHz band are occupied by incumbent systems, limiting the channels available for unlicensed devices. Second, the latest generations of Wi-Fi require access to much wider channels to deliver gigabit to multi-gigabit speeds and greater capacity for data-intensive applications; other ISM bands don't have enough contiguous spectrum to meet those needs, making 6 GHz essential to Wi-Fi's continued growth, reliability and success. Without access to the entire 6 GHz band, these technologies would have nowhere to operate. The beauty of unlicensed technologies, though, is their ability to coexist with other technologies and utilize spectrum efficiently without the need for exclusive access – key considerations for policymakers considering spectrum allocation decisions.

Today, studies are underway to see if currently occupied federal bands could be opened up or shared with commercial use. This includes the 7-8 GHz (7.125-8.4 GHz) band immediately adjacent to the 6 GHz Wi-Fi band where the latest generations of unlicensed technology are being deployed. The current 6 GHz unlicensed band ends at 7.125 GHz. The ongoing studies are considering whether shared access above 7.125 GHz is feasible. Given that several federal agencies, including the Department of Homeland Security (DHS), Department of Defense (DoD), NASA, NOAA, Federal Aviation Administration (FAA) and

[52] https://www.linkedin.com/pulse/wi-fi-integral-part-our-everyday-life-anurag-bose/.

[53] https://www.opensignal.com/2024/10/31/wi-fi-drives-smartphone-data-consumption-in-the-us-but-trends-vary-across-operators.

Department of Energy (DOE), currently and intensively use the 7-8 GHz frequencies for border and national security, weather and natural disaster mitigation, flight and energy management, a shared solution, like unlicensed, is the optimal way to allow commercial use and economic growth, without disrupting, undermining or adding significant government costs to those important federal operations. And, extending access for unlicensed operations above 7.125 GHz would create additional 320 MHz Wi-Fi channels to support upcoming Wi-Fi 7-based applications, like telemedicine, AI, AR/VR/XR and more, and add essential bandwidth to meet and keep pace with continuously growing Wi-Fi demands. Given the nature of the incumbents in the lower 7 GHz band, the techniques used to enable sharing in 6 GHz (such as low power indoor-only restrictions) can easily be ported over, making the extension of the 6 GHz band a no-brainer.

Other countries, under the influence of Chinese 5G equipment vendor pressure, are considering whether to make the full 6 GHz band (1200 MHz) available for unlicensed device use, pinning their hopes on the development of a currently non-existent 6G ecosystem in the upper half of the band. This is a mistake. Not only is the prospect of a 6 GHz 6G ecosystem years away, but there are significant opportunity costs to not making the full band available for unlicensed operations. First, a massive ecosystem for unlicensed devices at 6 GHz already exists. In North America alone, the number of 6 GHz-enabled consumer devices will grow by roughly 288% over the next five years, from 95 million in 2024 to approximately 367 million by 2029.[54] Second, by the end of the decade, the majority of U.S. households will be using Access Points that support multi-gigabit Wi-Fi speeds, using the latest 320 MHz-wide (10 Gbps capable) channels.[55] Countries waiting to make the full 1200 MHz available for unlicensed access are wasting the opportunity to be a part of this massive ecosystem, stifling economic growth for years to come.

Moreover, any country that is considering a reduction in the amount of spectrum available for the latest generations of Wi-Fi technology would be making an even bigger mistake. Back-tracking on major 6 GHz policy decisions would have substantial disruptive and harmful effects on consumers and businesses. Firmware updates to remove channels would require significant development costs and may not be consistently implemented across the ecosystem. Furthermore, reducing the availability of 6 GHz spectrum for unlicensed devices would also increase contention between Wi-Fi users, harming consumers' connectivity experience. As more and more 6 GHz-capable devices enter consumers' hands in the coming years, this problem will only be exacerbated.

Instead, promoting U.S. unlicensed technology and the companies that support it, while ensuring all Americans can continue to benefit from the latest generations of Wi-Fi, should be at the top of U.S. policymakers' list. And, given how easy and efficient it will be to support additional Wi-Fi needs, supporting unlicensed spectrum requirements is low-hanging fruit ready for picking.

[54] https://go.abiresearch.com/lp-wi-fi-innovation-and-future-spectrum-allocation.

[55] Id.

Full-Power Exclusive Licensed Spectrum is Not a Sustainable Model

As U.S. policymakers consider how to make additional spectrum available for the myriad consumer and industrial bandwidth-intensive use cases that are only beginning to emerge, it is critical to recognize that the traditional model of full-power exclusive licensing does not fit the moment and comes at a huge cost to America. First, there's no unused spectrum left. So tough choices will have to be made if bands are to be cleared and auctioned for exclusive use. Shared licensing regimes, such as CBRS or unlicensed, on the other hand, are a more prudent approach and allow for continued innovation and connectivity without putting existing uses at risk. Second, putting all of our eggs in the same basket (e.g., all of our commercial spectrum in the hands of the same three companies) risks U.S. geopolitical, commercial, and technological leadership that benefits from the democratization of spectrum access among a diverse array of users.[56]

From a national security perspective, re-allocating government spectrum for exclusive licensed use comes at a huge risk given the disruption it will create to incumbent users such as DoD, DHS, NOAA, NASA, etc. As Senator Rounds recently noted, "the binary choice many in the telecommunications industry are lobbying Congress to make would kill President Trump's Iron Dome for America and continue to leave the U.S. homeland exposed to an array of long-range strike threats ranging from intercontinental ballistic missiles to cruise missiles to hypersonic weapons."[57] Forcing federal operators, particularly DOD, to further compress their operations (as they were in the AMBIT band) or relocate to different spectrum bands puts at risk our military readiness.

Our international allies also recognize this risk and are being judiciously cautious about disruptions in bands such as 7 GHz that are critical for military, including NATO, operations. In fact, our adversaries (especially China) are specifically lobbying other countries to designate these bands for commercial IMT as a way to prop up their own state-subsidized interests, like Huawei, at the expense of US and Western national security. From a natural disaster management and public safety perspective, allocating more exclusive licensed spectrum - particularly in the 7 GHz band – will create huge risks to America's ability to track weather, predict and mitigate the increasingly severe storms and natural disasters. Similarly, America's space exploration industry is at risk if spectrum that supports these capabilities is cleared and auctioned off.

It's also inefficient and costly to clear bands that could be opened using sharing approaches. As the Brattle Group found,[58] it will be far more expensive to move DoD out of the lower 3 GHz band than it would be to share. Vacating systems from the 3.1-3.45 GHz band so it can be auctioned will cost DoD $250 billion.[59] However, a CBRS-style sharing model in this band could lead to over $18 billion in value to new users.[60] A cost/benefit analysis of our spectrum management decisions should be the first step in calculating how much "profit" auctions actually make. It's not as straightforward as putting spectrum on

[56] https://broadbandbreakfast.com/broadband-breakfast-on-october-9-2024-democratizing-spectrum-access/.

[57] https://defensescoop.com/2025/02/26/spectrum-5g-policy-congress-trump-dod-iron-dome-senator-mike-rounds/.

[58] https://www.ncta.com/whats-new/new-study-shows-shared-spectrum-benefits-government-taxpayers-and-business.

[59] https://defensescoop.com/2023/07/31/pentagon-spectrum-access-5g-commercial

[60] https://spectrumfuture.com/wp-content/uploads/2023/09/Spectrum-for-the-Future-Brattle-Study-One-Pager.pdf.

the auction block and raking into billions of proceeds. Consideration must be given to the actual cost (and delay) of clearing out incumbent operations.

Geopolitically, it's also important to recognize the game that China is playing. By pushing for more exclusive licensed IMT spectrum around the globe, China is really just driving demand for equipment from manufacturers like Huawei, which owns most of the patents for 5G. Countries in developing regions, including Africa and Latin America, have become increasingly reliant on Huawei, which offers heavily subsidized, cheaper equipment to strengthen ties, create dependencies, and increase global influence. This influence peddling was clear at the World Radio Conference in 2023 where China deployed Huawei representatives and promised free, or heavily subsidized, equipment to LATAM, particularly Brazil and Mexico, for their support of an IMT identification in the 6 GHz band. Brazil has been so enthralled by China's advances that it reversed its decision to make the full 1200 MHz in the 6 GHz band available for unlicensed use – a decision that was critical to the adoption of U.S. policy in the rest of the Americas. We must demand that our allies aid us in impeding Chinese-owned equipment domination and instead support wireless policies that leverages U.S. high-tech manufacturing. The U.S. administration, including DoD, can promote U.S. technology by actively advocating at international organizations, such as the ITU and CITEL, to make the case for shared spectrum (non-Huawei supported) models. The White House's recent announcement that it will work with Japan and like-minded partners to "deliver high quality infrastructure investments in the region, including the deployment of Open Radio Access Networks in third countries"[61] is an important step in the promotion of U.S. wireless technology and manufacturing.

Finally, we need to promote democracy not only as a means of governance, but from a spectrum access perspective as well. U.S. businesses have demonstrated that they want and need advanced wireless connectivity to support their growth. They do not want to have to rely on others to provide that connectivity for them. It's costly, inefficient, and comes with security risks. If we continue to only make spectrum available to the three big mobile network operators, we hamstring additional wireless competition and American businesses that want to manage their own destiny. The CBRS auction that saw a record number of bidders and license winners, together with the massive growth of CBRS GAA users (over 1,200 to date) demonstrate how valuable spectrum access is and how important it will be for ensuring U.S. economic growth, national security, and leadership.

[61] https://www.whitehouse.gov/briefings-statements/2025/02/united-states-japan-joint-leaders-statement/.

Maintaining the U.S. Lead in Wireless

The U.S. has already shown that we are the global leader in wireless technology and advanced spectrum management. To extend that lead, we must ensure scarce resources, like spectrum, are being used efficiently and effectively. It's time to put the pedal to the metal in the global race by safeguarding both national and economic security, promoting U.S. advanced high-tech capabilities, and supporting a world-class, modernized U.S. and allied manufacturing and industrial base through cutting-edge spectrum management policies and practices.