

The National Security Benefits of Reallocating Federal Spectrum for 5G



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The United States faces a large and growing gap with China in radio frequency spectrum allocated for 5G wireless communications, particularly mid-band spectrum

bands licensed for wide-area coverage, which constitute the primary arteries of the 5G economy and the broader global ecosystem of wireless connectivity. This gap threatens core U.S. national security interests, and China's spectrum strategy is deliberately seeking to exploit it in order to advance its own interests. To address this licensed spectrum shortage as technology advances and industry develops more products and services that rely on spectrum, the United States needs to move urgently to allocate more mid-band spectrum for licensed commercial 5G use. If it does not do so, the U.S. spectrum shortage will hinder technological innovation and give China an open path to global leadership in the connected future of the twenty-first century, threatening the economic and national security of the United States.

Providing more licensed mid-band spectrum for 5G will require a carefully coordinated effort to develop effective coexistence mechanisms or potentially relocate certain users of this spectrum, which provides ideal characteristics for 5G deployment. The U.S. government and industry have successfully undertaken this challenge before. Reallocating or otherwise transitioning spectrum for the purpose of achieving the most effective and efficient use of that spectrum will be indispensable for U.S. security interests, as the country needs a vibrant technology economy to counter autocratic governments that seek to undermine free market democratic governance. Reallocation requires careful and intentional coordination between government and industry to ensure that incumbent users have the resources they need for continued operation of critical government systems, and that new users have the certainty necessary to invest in new products and services that rely on their new licensed spectrum rights. Reallocation requires coherent government processes and a carefully planned transition with industry, and experience has shown that this is possible.

The 5G Spectrum Shortage in the United States Threatens U.S. Security Interests

The United States is becoming vulnerable as a “spectrum island” by not allocating sufficient mid-band spectrum for 5G. As discussed in the [first paper](#) in this series, the allocation of licensed spectrum is a strategic issue that is core to U.S. economic strength and technological innovation—and also to U.S. security because commercial strength is the foundation of national security, both in peace and war. The

extraordinary scale, capacity, and dynamic technological innovation of the United States and its allied industrial base have been the country's greatest strength for over a century, and it was indispensable to victories in World War II and the Cold War for the United States and its allies. This will also be the case in the twenty-first century, in which the key strategic security question is whether the United States and its market democratic allies will set the world's course, or if China, Russia, and other authoritarian regimes will predominate.

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Most of the crucial emerging technologies necessary for sustained U.S. leadership are being developed by the private sector. Spectrum allocations shape markets domestically and internationally and affect the pace and scope of innovation of these technologies. China knows this and is seeking dominance in every key technology sector in the world; China's spectrum strategy for 5G is central to its long-term strategic plans. The ubiquitously connected society driven largely by 5G wireless broadband will provide connected and autonomous vehicles, connected warehouses and logistics, and remote sensors in every sector. This connectivity will capture exponentially more digital data than has ever existed in history, expanding the capabilities of artificial intelligence (AI), advanced analytics, and cyber capabilities beyond anything imaginable today. This will be a crucial national security domain for both autocracies and market democracies in the twenty-first century.

In line with this strategy, China has already allocated a significant amount of mid-band spectrum to commercial 5G. In five years, China is expected to lead the world, with up to 1160 megahertz (MHz) of mid-band spectrum available for commercial 5G. Further, China is aligning with other countries to harmonize their spectrum allocations with its own. Countries that harmonize spectrum gain larger market shares for equipment

designed to use specific frequencies and benefit from greater and more versatile performance. China knows this and is acting accordingly. China's recent international advocacy leading up to the World Radiocommunications Conference (WRC) indicates that it will support the harmonization of 1490 MHz of spectrum for potential new 5G use; the United States is supporting nearly 80 percent less.

This is a potential long-term national security catastrophe. If the United States does not lead in 5G-enabled innovations, China will—and the repercussions would be dire. As the United States demonstrated through the advances that resulted from its world-leading deployment of 4G LTE, countries that invest in the next generation of wireless communications, including by allocating the necessary spectrum for commercial uses, will reap strategic advantages from the resulting technological innovations and economic dynamism. In particular, 5G will dramatically impact industries as wide-ranging as healthcare, energy, transportation, law enforcement, e-commerce, logistics, and education.

China's government recognizes this fact and correctly sees global technological leadership as a lever of strategic security. Consider the threat to the United States of a TikTok or Huawei equivalent “national champion” dominating every key sector of the global economy—including those related to weapons and force projection, such as quantum computing, AI, and cyber operations. There are no weapons, technology bans, or mitigation possibilities that could adequately defend U.S. security interests in such a scenario.

Despite the grave national security implications of China's potential lead in 5G, the United States faces an acute shortage of crucial mid-band licensed spectrum, the most valuable spectrum for 5G. Experts expect that the United States will have a substantial deficit of 400 MHz by 2027 and 1400 MHz by 2032. China has allocated over 70 percent more licensed mid-band spectrum for 5G than the United States. This mid-band gap gives China a free competitive advantage in industries that are vital to future U.S. technology leadership and thus to U.S. security interests. If this spectrum shortage is not addressed, the United States will cede the future to China, hindering U.S. innovation in essential industries that use wireless technologies, including robotics, cloud computing, biotechnologies, and military communications, logistics, and weapons systems.

Key U.S. allies also are allocating more licensed spectrum for 5G, recognizing that this is essential to drive large-scale 5G deployments. The United States is hundreds of megahertz behind countries such as Japan, the United Kingdom, and South Korea in providing licensed spectrum for 5G. As the next paper in this series will detail, many U.S. allies currently have commercial 5G operations in the lower 3 gigahertz (GHz) band, including allies that host U.S. military bases or purchase U.S. defense equipment systems that operate in that range. In short, there is no reason for the United States to lag behind China.

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With this drastic spectrum shortage looming, the United States urgently needs to find more spectrum for commercial 5G use. Since government users have been allocated 61 percent of the lower mid-band spectrum (compared to less than 10 percent for licensed commercial users), it will be necessary to find opportunities for coordinated, full-power licensed use for wide-area coverage—including effective coexistence mechanisms or, in some cases, relocating federal users to other bands—in order for the United States to have sufficient spectrum to lead the 5G world. To defend and advance its national security interests, the United States must reallocate spectrum for commercial use. This strategic security need to address the spectrum shortage is most acute in licensed commercial spectrum for wide-area deployments that are the lifeblood of the mobile ecosystem and central to the collective and growing demand for ubiquitous high-performance networks.

Reallocation Requires Planning and Coordination—and Provides Funding to Advance Federal Agency Missions

Effectively reallocating spectrum requires coherent government processes to provide certainty to new users and an orderly transition to incent and support coexistence or relocation of incumbent users. Certainty promotes investments, as companies can be

confident that the resources they invest in licensed spectrum will not be wasted due to changes in the rights to use that spectrum.

The United States has a history of successfully reallocating spectrum to make more effective or efficient use of frequency bands. Past reallocations show that all parties involved benefit when the U.S. government (1) makes discerning decisions to open spectrum to commercial licensed use, (2) applies proceeds from license auctions to financially support government agencies in the transition, and (3) carefully coordinates across agencies and pertinent industry stakeholders. U.S. government agencies benefit from upgraded equipment, companies benefit from expanded access to spectrum for innovative uses, and the American people benefit from a more prosperous and innovative economy. This is the well-worn path that is required now to defend and advance U.S. security interests in the twenty-first century.

U.S. law has a tried-and-true statutory vehicle for ensuring that auction proceeds benefit any federal agencies that must relocate to other spectrum bands or upgrade their equipment. Nearly two decades ago, Congress passed the Commercial Spectrum Enhancement Act (CSEA), which created the Spectrum Relocation Fund (SRF), the mechanism to provide funds for costs associated with agencies relocating to new bands or adopting new technologies. The SRF is funded by auction revenues and ensures revenues will support federal agency relocations, with the CSEA requiring proceeds from any auction to be at least 110 percent of the total estimated relocation costs. The CSEA also provides certainty for auction winners and a streamlined process for funding agencies' relocations, as well as oversight and transparency regarding how these funds are being used. Previously, auction winners had to negotiate with federal agencies regarding the costs to relocate and timelines for moving from the auctioned band. Now, federal agencies need to provide a timeline and estimated costs. Additionally, pursuant to subsequent amendments to the CSEA, these estimated costs can include costs for planning, system upgrades, and research and development, and agencies are paid immediately after an auction. Additionally, these subsequent amendments provide new mechanisms to fund efficiency improvements that allow for coordinated coexistence in certain spectrum bands rather than full relocation of incumbents to other bands.

History shows that reallocation can work if the federal government leads and collaborates with commercial stakeholders. The Advanced Wireless Services (AWS-1) auction in 2006 was an overwhelming success in coordination across 12 federal agencies, including the National Aeronautics and Space Administration and the Departments of Agriculture, Interior, and Energy. With \$13.7 billion in revenue and a return on investment of over 775 percent, revenues easily exceeded the CSEA minimum and provided ample funding for agencies to upgrade to digital systems and IP-based communications systems. The National Telecommunications and Information Administration (NTIA) and Office of Management and Budget ensured that agencies successfully implemented transition plans and addressed unforeseen challenges. In this particular case, costs for relocation came in at \$400 million over the initial agency estimates, but the SRF was sufficiently funded to cover those unexpected agency costs.

In several other relocation experiences, the initial estimates were actually far higher than the ultimate SRF outlays needed to fund relocation. For instance, in 2014 and 2015, with over \$41.3 billion in revenue, the AWS-3 auction brought in a return on investment of over 700 percent. This auction required relocation and coordination with 16 federal agencies and more than 100 different federal wireless systems. Through NTIA leadership and collaboration with commercial stakeholders, the government overcame challenges such as accommodating federal uses of the band where relocation would have been cost prohibitive or impossible. Further, the costs of relocation following the AWS-3 auction have been approximately *half* of NTIA's original estimates.

More recently, the Department of Defense agreed to relocate from the 3.45-3.55 GHz band in 2020 in favor of commercial use to advance the deployment of 5G in the United States. The result was \$21.8 billion for the U.S. government and over 100 MHz available for auction winners (and the American people) to use. Deployment is early in the process, and coordination between the private sector and government has followed similar paths to processes for the AWS bands, with unique considerations for the novel Cooperative Planning Areas and Periodic Use Areas. In some cases, this may include coexistence mechanisms that allow certain government systems to remain in the band based on coordinated sharing arrangements.

The AWS and 3.45 GHz models show that collaboration between the private sector and government can create mutual benefits. Federal agencies, including the Department of Defense, can maintain and in many cases upgrade or otherwise advance their vital operations, while commercial providers can build out their 5G networks nationwide to drive U.S. technological leadership worldwide.

Coherent Government Processes Are Needed for Orderly Reallocation

The United States needs coherent government processes for reallocation to ensure that spectrum is used to best advance U.S. economic and national security interests. It is important for the U.S. government's two spectrum regulators—the Federal Communications Commission (FCC) for commercial spectrum and NTIA for federal spectrum—to be the ultimate decisionmakers, and NTIA should serve as the central agency to represent federal government interests. When different government agencies are not on the same page, deployment can be delayed, government and private resources can be unnecessarily spent, and allocation decisions that impact U.S. economic and national security can be hindered.

First and most fundamentally, Congress needs to restore the FCC's spectrum auction authority, a groundbreaking approach to efficient spectrum allocation that brought the Nobel Prize in Economic Sciences to the economists who developed the concept. In March of this year, Congress allowed the FCC's authority to auction spectrum lapse for the first time since the first authorization three decades ago. Without this general authority, the FCC cannot schedule necessary auctions to overcome the U.S. spectrum shortage. As long as this lapse continues, it creates an impassable roadblock to catching up to China in allocating valuable 5G spectrum; while the United States lacks a mechanism to allocate spectrum, China will continue to advance 5G along the deployment path that its authoritarian government has laid out, with global technology domination in mind. In the immediate near term, as FCC chairwoman Jessica Rosenworcel recently noted in congressional testimony, if the U.S. negotiating team goes to the WRC in October without auction authority, it will undermine U.S. credibility in negotiations, both for issues on the table this year and also for setting the agenda for WRC 2027.

Second, as the federal government's halting process in C-band showed, a fragmented process can cause confusion and delay the deployment of 5G services. The C-band auction raised record numbers, with wireless providers collectively paying over \$80 billion for licenses. However, divides within the federal government—including approval from the FCC and NTIA but questions about safety issues from the Federal Aviation Administration—delayed the launch of 5G. The Interdepartment Radio Advisory Committee (IRAC), composed of representatives from federal agencies with spectrum interests that help NTIA manage federal use of spectrum, is an essential tool to develop a coherent and unified government spectrum policy. The IRAC plays an important role in advising NTIA of government interests and distributing information across affected agencies in the context of FCC proceedings on commercial use of spectrum. These interagency processes are critical to U.S. leadership in 5G. After years of engagement across the agencies and their regulated industries, wireless companies are now expected to operate with temporary and minimal restrictions while the aviation industry addresses its concerns regarding older aircraft equipment. Still, these delays reinforce the importance of NTIA serving as the voice of the executive branch in its recommendations to the FCC on commercial spectrum.

Third, stakeholders should work together collaboratively to make spectrum reallocation work. In a wireless world, spectrum allocations need to have room to take advantage of technological innovations. Reallocation can be a win-win when incumbent users are provided the resources to succeed, and new users are provided the certainty and spectrum necessary for technological innovation and to implement new uses. The process should not be rigid, as every reallocation, band, and system is different. Reallocation can be guided and organized to benefit all parties, so long as all parties come to the table transparently and with an eye to mutual benefit and advancing the interests of the United States, rather than a zero-sum game with distinct losers and winners.

Commercial Licensed Spectrum for 5G Is Indispensable to U.S. Security Interests

Will the future consist of freedom and innovation promoted by market democracies such as the United States and its allies or surveillance and control imposed by autocratic governments such as China? The U.S. role in advancing commercial