Statement before the

United States Senate Committee on Commerce, Science, and Transportation

America Offline? How Spectrum Auction Delays Give China the Edge and Cost Us Jobs

A Testimony by:

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Chairman Cruz, Ranking Member Cantwell, distinguished Members of the Committee, thank you for allowing me to share my views with you on spectrum. I have worked on spectrum issues for nearly 15 years, and so it is a special honor to testify in front of the Senate committee that has repeatedly adopted legislation to ensure that the United States is at the forefront of spectrum policy and wireless technology. The Center for Strategic and International Studies (CSIS) does not take policy positions, so the views represented in this testimony are my own and not those of my employer. In my testimony, I will 1) explain the importance of the United States taking a leadership role on spectrum policy for U.S. economic growth, economic security, and national security; 2) draw attention to recent developments that threaten the ability of the U.S. to out-compete and out-innovate its adversaries in wireless technology; and 3) urge Congress and the Administration to take several key actions so that the United States leads the world in wireless innovation.

Spectrum and U.S. Leadership

It is critical for the United States to play a leadership role in spectrum policy. In recent years, for example, the People's Republic of China (PRC) has spent tens of billions subsidizing Huawei, as part of an effort to destroy the non-PRC wireless industry, dominate the global market for wireless services, and control the future of this strategically vital technology. The U.S. is not—and should not—take the PRC's approach of picking a winner and providing that company with massive subsidies. The threat posed by the PRC, however, makes it absolutely critical for the U.S. to use the other policy levers it has available to advance our position in wireless innovation and technology, and making spectrum available for commercial use is one of the key ways to ensure that we are able to do so.

Over most of the past thirty years, our country has been successful in leading the world in spectrum policy. During that time, our nation was able to make a massive amount of spectrum available for commercial use, thus providing great benefits to the American people, while at the same time preserving and expanding federal spectrum-based capabilities,.

In 1993, Congress authorized the Federal Communications Commission (FCC) to allow competitive bidding for spectrum licenses, and we became the first country to hold a major spectrum auction. Since 1994, the FCC has held 100 spectrum auctions that raised over $233 billion for the U.S. Treasury. Moreover, the total cost of the auctions program was less than 1% of what the auctions brought in. That represents an incredible return on investment for the American taxpayer.

Auctions have been even more instrumental, however, in promoting technological innovation and economic growth. If we look at the period between 1985 and 2020, when the United States made a tremendous amount of high-power spectrum available, wireless operators invested over $600

billion in their networks.[1] The contribution that the wireless industry made toward the larger U.S. economy was even greater—according to one estimate, U.S. networks supported 20 million jobs, contributed $700 billion to the economy in a single year, and were responsible for almost 10% of the GDP increase that the U.S. economy experienced during the period of 4G/LTE deployments.[2] Looking forward, another study estimates that by 2030, 5G will add between $1.4 trillion and 1.7 trillion dollars to U.S. economic growth.[3]

While holding auctions has been critical to economic growth, there were other factors that made the United States a success in wireless policy. In many cases, the United States was successful at achieving international harmonization for the spectrum bands we adopted here, which allowed us to create a global equipment ecosystem and benefit from economies of scale. Moreover, Congress has repeatedly provided guidance to the FCC, the National Telecommunications and Information Administration (NTIA), and the many agencies that use spectrum on making spectrum available, including spectrum that was made available for high-power use, and has given the FCC and NTIA authority and flexibility to orchestrate complex spectrum transitions and determine the rules of the road Each time Congress reauthorized the FCC to hold auctions—in 1997, 2006, and 2012—it provided a statutory target for making spectrum available for commercial use, enabling the FCC to make high-power spectrum available.

Congress also expanded the ability of NTIA and FCC to manage complex spectrum transitions, such as giving them the ability to reimburse federal agencies for relocation and sharing expenses in the 2004 Commercial Spectrum Enhancement Act and expanding on the activities that were able to be reimbursed in the Bipartisan Budget Act of 2015. Finally, Congress expanded on the FCC's authority to hold auctions, authorizing it to hold incentive auctions in 2012. Congress has also recognized and preserved the Commission's ability to adopt the rules of the road, so that engineering rather than politics determines the technical details of spectrum management. These actions were all critical to ensuring that the United States adopted a forward-leading, innovative approach to spectrum policy.

I have focused thus far on licensed terrestrial spectrum, but I would also like to recognize the key role of low-power, unlicensed spectrum, as well as spectrum for satellite use. First, the U.S. was the first country to adopt rules for low-power unlicensed spectrum, which has powered innovation and our economy. The FCC first adopted rules for "junk" bands that were undesirable and unused in the 1930s—the concept was that anyone would be allowed to use the spectrum without obtaining permission from the government, provided that the equipment they used could not cause harmful interference to licensed users. During the 1980s, we began to see use of these frequencies for

[1] https://api.ctia.org/wp-content/uploads/2022/12/Compass-Lexecon-Licensed-Spectrum-Report.pdf
[2] https://apnews.com/press-releases/pr-newswire/4g-wireless-transformed-americas-economy-new-study-shows-fbf58a1343f9e7ae38129b48aa1d6b62
[3] https://www.bcg.com/publications/2023/accelerating-the-5g-economy-in-the-us#:~:text=The%205G%20economy%20is%20the,trillion%20in%20US%20economic%20growth.

common household applications such as garage door openers and baby monitors. More significantly, beginning in the 1990s, we saw the development of Wi-Fi and Bluetooth. By leveraging the permissionless innovation that the FCC provided in its unlicensed rules, the developers of those technologies have greatly increased our connectivity and contributed nearly $100 billion per year to the U.S. economy.[4]

Second, the U.S. has also been a leader in licensing spectrum for satellite technology. As a result, U.S. companies built and launched many of the pioneering communications satellites in the 1960s. Now, U.S. companies have launched, or are in the process of launching, massive low earth orbit (LEO) constellations that can provide broadband internet on a global basis. These constellations are particularly useful in rural and remote areas. Thus far, LEO is a critical market in which we have outcompeted the PRC, though I would note that continued leadership in satellite spectrum is critical as the PRC attempts to launch clones of our successful LEO networks.

While the U.S. has traditionally played a leadership role in wireless, I believe that—regretfully—we are falling behind the rest of the world in spectrum policy. As you know, in March 2023, the FCC's authority to hold spectrum auctions lapsed. Many countries have deployed new networks in prime mid-band spectrum such as the lower 3 GHz band that we have not made available for commercial use, threatening to leave the United States behind. There is a lack of logic for failing to make that spectrum available in the U.S., given that key U.S. allies have already deployed in this spectrum using many of the military systems that we use to protect the homeland. It is critical to restore FCC auction authority and to create new opportunities for licensed and unlicensed spectrum use, particularly in mid-band spectrum. We need Congress and the Administration to set ambitious goals for making spectrum available for commercial use, so that we can make spectrum available for high-power and low-power use. At the same time, we must empower the FCC, NTIA, and the agencies to proceed in a systematic way based on sound science and engineering, and preserving key capabilities of the Department of Defense (DOD) and other departments and agencies.

Another area that threatens U.S. leadership involves delays in licensing spectrum for satellite use. As noted, U.S. companies currently have a strong leadership position in providing broadband internet globally, but they won't be able to maintain that lead if they are unable to obtain timely access to spectrum. In this context, it is important to note that satellite operators have faced significant delays when making requests to modify their licenses—in fact, it has taken an average of three years for the FCC to grant or deny many requests.

[4] https://www.cta.tech/Resources/Newsroom/Media-Releases/2022/January/Unlicensed-Spectrum-Generates-95-Billion-Per-Year

Spectrum and Economic Security

As I mentioned, spectrum plays a critical role in ensuring that our economy grows, and that provides a strong rationale to adopt forward-leaning spectrum policies. However, I would also note that spectrum is important to our economic security—that is, our ability to ensure that the United States has a stable and resilient economy. Economic security requires the United States to control key technologies so that home-grown companies can protect and sustain our economy in the face of potential global risks, shocks, and dislocations.

Spectrum is critical to economic security because it provides a foundation for U.S. companies to innovate. Take, for instance, the app economy. Many Americans take it for granted that U.S. companies such as Uber, Lyft, and Airbnb are at the top of the app store charts. Few understand, however, that it was spectrum policy that played a decisive role in enabling American innovators to make that happen. In 2008, we were the first country to auction the 700 MHz band—and this band was critical to wireless leadership at the time because it enabled mobile providers to broadly deploy new wireless services to the public across wide geographies. After we moved first on this spectrum, the United States quickly built 4G/LTE networks. Once these networks became available, U.S. innovators were the first to experiment and develop mobile apps, enabling U.S. companies to lead the world in the app economy, and unlocking hundreds of billions of dollars in economic benefits.

Looking forward, wireless networks will serve as the proving ground for the next technology that is central to our economic security: artificial intelligence (AI). For AI to be fully integrated in our daily lives, AI-enhanced services and the data traffic they generate will need to be sent to—and from—the mobile devices that we carry around with us. Such devices will be able to rearrange our schedules better than any human assistant, edit our photographs with more skill than any professional photo editor, and get us home faster and more safely than the most experienced professional driver. But U.S. companies won't be able to develop and deploy all those AI applications unless we make additional spectrum available to handle all that increased data traffic, particularly so that there is uplink capacity from devices to mobile networks. Unless the United States is a leader in spectrum, we risk losing the ability to easily develop such applications, and with it control over this strategic technology.

Spectrum and National Security

As discussed, the connections between spectrum, on the one hand, and economic growth and economic security, on the other hand, are underappreciated. When it comes to the role of spectrum policy in protecting our national security, however, we unfortunately face many misunderstandings and misconceptions. I have strong views on this question because I have seen the role that spectrum policy plays from the national security perspective. I spent ten years at the FCC managing spectrum

transitions and auctions. I'm incredibly proud of the work we did to advance the U.S. wireless industry there; for instance, in Lower C-band, our efforts resulted in the largest spectrum auction—and likely the largest auction of any type—in world history, with over $81 billion in gross bids. More recently, however, I moved over to the National Security Council, where I oversaw policy related to spectrum and satellite use, including electronic warfare and other national-security related uses of spectrum. I have a deep appreciation for the critical role that spectrum plays in safeguarding the United States and its allies and partners.

Some stakeholders have publicly taken the position that making spectrum available for commercial use is no longer desirable given that most of the commercially-attractive frequencies are used by DOD. I agree with them that DOD uses spectrum to protect our nation, and that it is critical that we ensure that DOD has all the capabilities it needs to do so. Please note, however, that the key term I used is "capabilities"—unfortunately, some stakeholders have confused things by implying that to preserve all of DOD's "capabilities," we need to prevent commercial users from ever gaining new access to the spectrum that DOD uses. To the contrary, it is possible to preserve and even expand DOD's capabilities by modernizing the systems it uses, while creating more opportunities for commercial use.

Take, for instance, the Airborne Warning and Control System (AWACS), which is a key, airborne radar system that operates globally and provides an early warning to the United States, as well as its key allies, regarding potentially hostile ships, aircraft, vehicles, and missiles, in addition to serving a critical command and control function during aerial combat. DOD deployed the first production-model AWACS in 1977, meaning that right now we're still relying on a radar system that was put into service when Happy Days and Three's Company were on television. As DOD plans to upgrade this system, we have a critical opportunity to ensure that we are operating the most advanced radar system in the world, and that such a system is spectrally efficient and future-proof. After all, to address challenges by competitors such as the PRC and adversaries such as Russia, we need to deploy these systems not only in our homeland, but also to key U.S. allies, many of which have already deployed 5G in mid-band frequencies that we have not auctioned.

I would note that AWACS is only one system and that DOD has many other systems in the mid-range spectrum bands that are being targeted for commercial use. There are numerous issues for the FCC, NTIA, and the agencies to work through, and the spectrum transitions that will result will be complicated. Nonetheless, I've seen technical experts at the FCC, NTIA, and the agencies successfully work through these issues many times in the past, and I am confident that they can do so again now. It is important for Congress to set goals and timelines so that the FCC, NTIA, and the agencies know what to aim for, and so that industry has sufficient certainty regarding the future availability of spectrum. It is equally important for the Administration to make it clear to the agencies that spectrum is a priority and that political actors should not block engineers from working through technical challenges on behalf of the President.

There is also a misunderstanding about whether Congress needs to provide additional statutory protections to prevent the spectrum repurposing process from threatening our national security. Under Section 1062 of the 2000 National Defense Authorization Act, which is a provision that remains in effect, spectrum that DOD uses cannot be surrendered for commercial use unless the Secretary of Defense and the Chairman of the Joint Chiefs jointly certify to key congressional committees that they will have access to other spectrum that maintains essential military capabilities. This is only one example of the numerous statutory protections that Congress has already adopted to ensure that our military can maintain its spectrum-based capabilities.

Another misconception about spectrum and national security is that we only need to ensure that DOD has access to spectrum and can procure equipment, and this will be sufficient to protect our national security needs. This view is extremely short-sighted, as in the future the U.S. military will no longer have the budget to meet all its future needs but rather will need to leverage commercial technology to prevail over our competitors and adversaries. If we look at the example of semiconductors in the 1960s, the U.S. military dominated the market, purchasing all the integrated circuits that were produced. By the 2020s, that number had fallen to 2 percent of the U.S. market. The trend was inevitable across the entire technological sector: as technology has exploded across economic markets, both in the United States and abroad, our military simply no longer has the purchasing power to consistently move markets and ensure innovation. Instead, DOD needs to take advantage of commercial innovation from our companies to ensure that it stays ahead of our competitors and adversaries.

In the domain of wireless technology, we're already seeing this play out in the battlefield in Ukraine, where commercial wireless networks and smartphones have directly transformed command, control, communications, computing, intelligence, surveillance and reconnaissance. For instance, we have seen smartphones used to crowdsource information to predict UAS attacks, serve as nodes in a network that create accurate geospatial maps of developments on the battlefield, and triangulate enemy positions. In the future, as wireless networks carry actionable insights from AI and quantum computing, the side in a conflict that can leverage the most advanced commercial wireless technology will have a significant, and in some cases, decisive advantage. In wireless technology, DOD will not be able to leverage commercial innovation unless the wireless industry has access to spectrum, given that spectrum will serve as a critical determinant of whether the wireless industry is able to develop and deploy innovative technologies. Ensuring that we preserve critical military spectrum-based capabilities while creating opportunities for commercial access to spectrum is therefore essential to our ability to prevail in future conflicts.

Recommendations

I. For Congress

1. Restore the FCC's ability to conduct spectrum auctions.

2. In such legislation, provide targets, goals, and associated timelines for making spectrum available, particularly for mid-band spectrum, including the ability to make spectrum available for high-power and low-power use. This will serve as critical guidance to the FCC, NTIA, and the agencies as they work together on spectrum policy. It is important for these targets to be informed by discussions with the FCC, NTIA, and industry.

3. Adopt requirements that would apply to federal agencies to cooperate with NTIA and the FCC as they attempt to make spectrum available.

4. Preserve the discretion of NTIA and the FCC to determine the specific bands made available, and the ability of the FCC to determine the technical rules that would apply to spectrum.

5. Update the Commercial Spectrum Enhancement Act by offering agencies the opportunity to receive reimbursement under the Spectrum Relocation Fund (SRF) for upgrading their systems beyond what they are currently capable of doing, allowing NTIA the ability to receive funds to conduct studies and analyses of spectrum use, and providing the Technical Panel that reviews studies and transition plans further oversight over process after they have approved such studies or plans.

6. Elevate the Administrator of NTIA to an Undersecretary to improve the interagency process on spectrum.

7. Require streamlined procedures for granting satellite applications and shot clocks for granting or denying licenses.

8. To further advance our wireless capabilities, develop a comprehensive "system of systems" for position, location, and timing, which can back up and compliment GPS, and therefore mitigate vulnerabilities and enhance reliability for both federal and commercial users.

II. For the Administration

1. Adopt ambitious goals and timelines that are informed by discussions with the FCC, NTIA, and industry.

2. Provide guidance and an escalation process to ensure that disagreements or disputes between the FCC, NTIA, and/or the federal agencies that use spectrum are quickly and properly resolved.

3. Ensure that planned spectrum transitions preserve critical national security, public safety, and other federal mission capabilities.

4. Develop a process that will enable the United States to arrive at positions on international spectrum allocations well in advance of the 2027 World Radio Conference.