

Before the
NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION
Washington, DC 20230

In the Matter of)
)
Developing a Sustainable Spectrum Strategy for) Docket No. 181130999-8999-01
America's Future)

COMMENTS OF ERICSSON

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Ericsson hereby submits comments in response to the Notice and Request for Comments (“*Notice*”),¹ in which the National Telecommunications and Information Administration (“NTIA”) seeks comment on “development of a comprehensive, long-term national spectrum strategy” as set forth in the Presidential Memorandum on Developing a Sustainable Spectrum Strategy for America’s Future (the “Spectrum PM”).²

I. INTRODUCTION AND SUMMARY.

Ericsson commends the Administration for the Spectrum PM and is pleased to respond to NTIA’s request for comment. As a leading supplier of information and communications technology to service providers throughout the world (with approximately 40% of global mobile traffic carried through its network equipment), Ericsson has a direct and immediate interest in the Spectrum PM and the development of a National Spectrum Strategy (“NSS”), particularly as they relate to 5G wireless service.

¹ 83 FR 65640 (Dec. 21, 2018).

² Presidential Memorandum on Developing a Sustainable Spectrum Strategy for America’s Future (Oct. 25, 2018) (“Spectrum PM”), <https://www.whitehouse.gov/-/presidential-actions/presidential-memorandum-developing-sustainable-spectrum-strategy-americas-future/>.

Today, Ericsson is boosting its U.S. investments in R&D and manufacturing to support accelerated 5G deployments.³ In 2017, Ericsson opened the Austin ASIC Design Center in Austin, Texas, to focus on core microelectronics of 5G radio base stations to accelerate the path to 5G commercialization. Ericsson is now manufacturing in the United States, producing radios for 5G, and all told, these facilities will have nearly 300 employees.⁴ And Ericsson is in the process of launching a new software development center in the U.S. charged with addressing the baseband technology needed for 5G, providing intelligence to the radio access network. Ericsson is in the process of building up a team of around 100 machine learning specialists in our Silicon Valley location as part of the drive to make 5G an AI-enabled technology.

These strategic initiatives will allow Ericsson to operate even closer to its customers, meeting the growing demand for 5G in the U.S. and globally. And, Ericsson has entered agreements to supply 5G equipment to the four nationwide wireless carriers in markets across the country.⁵ In September 2018, for example, Ericsson and T-Mobile announced a \$3.5 billion agreement in support of T-Mobile's nationwide launch of 5G service.⁶

³ See Press Release, Ericsson, *Ericsson increasing US investments to support accelerated 5G deployments* (Aug. 10, 2018), <https://mb.cision.com/Main/15448/2589865/889576.pdf>.

⁴ *Id.*

⁵ See, e.g., Press Release, Ericsson, *Ericsson a key partner in Sprint's 5G-ready Massive MIMO deployments* (Feb. 27, 2018), https://www.ericsson.com/en/news/2018/2/ericsson-a-key-partner-in-sprints-5g-ready-massive-mimo-deployments?utm_source=Facebook&utm_medium=social_organic&utm_campaign=MWC18_News_Sprint_Global_20180227; Press Release, Verizon, *Verizon Poised on Healthy Wireless Business and 5G Boom* (Dec. 27, 2018), <https://www.zacks.com/stock/news/344668/verizon-poised-on-healthy-wireless-business-and-5g-boom>; Corinne Reichert, *AT&T 5G to go live across 12 cities this week*, ZDNet (Dec. 18, 2018), <https://www.zdnet.com-/article/at-t-5g-to-go-live-across-12-cities-this-week/>.

⁶ Under the agreement, Ericsson will provide T-Mobile with the latest 5G New Radio (NR) hardware and software compliant with 3GPP standards. Press Release, T-Mobile, *T-Mobile and Ericsson Sign Major \$3.5 Billion 5G Agreement* (Sept. 11, 2018), <https://www.t-mobile.com/news/ericsson-5g-agreement>.

The Spectrum PM firmly expresses the Administration’s position on the race to 5G: “[I]t is imperative that America be first in fifth-generation (5G) wireless technologies.”⁷ When the U.S. seized leadership in 4G, the result was unprecedented growth in investment, innovation, consumer welfare, and contribution to the U.S. economy.⁸ It can do the same with 5G, first and foremost by making more 5G spectrum available in the near term; the objective here is to provide allocations of large amounts of contiguous spectrum that support several wide-bandwidth carriers. Ericsson commends NTIA Administrator and Assistant Secretary David Redl for his statement of the agency’s mission on 5G: “[O]ur chief responsibility will be finding enough spectrum to support competitive, ubiquitous and secure 5G in America.”⁹

Over the longer term, Ericsson agrees that “the Nation requires a balanced, forward-looking, flexible, and sustainable approach to spectrum management.”¹⁰ In the ever-ground breaking spectrum ecosystem, that is precisely what is needed to encourage investment and innovation, promote competition, and deliver the enormous benefits that 5G has to offer. To

⁷ Spectrum PM, Section 1.

⁸ *See, e.g.*, Remarks of David J. Redl, Assistant Secretary of Commerce for Communications and Information, CTIA’s Race to 5G Summit, Washington, D.C. (Apr. 19, 2018) (“Our leadership in 4G helped create hundreds of thousands of U.S. jobs and a booming market for American hardware and software. In countries that fell behind, the negative effects were dramatic . . .”), <https://www.ntia.doc.gov/speechtestimony/2018/remarks-assistant-secretary-redl-ctias-race-5g-summit> (“Redl Remarks”); Remarks of FCC Chairman Ajit Pai, White House 5G Summit, Washington, D.C. (Sept. 28, 2018) (“The U.S. was the first country to deploy 4G LTE networks at scale. For some time, even though we had less than 5% of the world’s population, America was home to a majority of the world’s 4G LTE subscribers. This made America the testbed for 4G innovation. It’s no accident that the app economy was born here. The net result was an additional \$100 billion in annual GDP and countless benefits for American consumers.”), <https://docs.fcc.gov/public/attachments/DOC-354323A1.pdf>.

⁹ Redl Remarks.

¹⁰ Spectrum PM, Section 1.

achieve this objective, the NSS must be grounded in certain key principles, including the following:

- ***Spectrum Pipeline.*** The United States should adopt a recurring process for a spectrum pipeline that (i) identifies federal spectrum that can be repurposed for commercial wireless services; and (ii) provides incentives for efficient and effective repurposing of non-federal spectrum. Where possible, spectrum should be globally harmonized with that of other countries, including use of “tuning ranges” for adjacent or near-adjacent spectrum.
- ***Exclusive-Use, Flexible-Rights Regime Wherever Possible.*** Exclusive use should remain the preferred spectrum access model, with flexible rights to allow wireless providers to respond quickly to market demand. Where spectrum sharing is the only path, rules should be as simple and flexible as possible to permit markets to develop and efficient technologies to evolve.
- ***Efficient Use of Spectrum.*** Efficiency of spectrum use should be prioritized in both the commercial and government sectors. Users of government spectrum should be encouraged to draw from technological developments in the commercial sector and to use commercial standards and services where they lead to greater network efficiency.

II. AS AN INITIAL MATTER, TO ADVANCE U.S. GLOBAL COMPETITIVENESS, THE NATIONAL SPECTRUM STRATEGY SHOULD ENSURE ADEQUATE SPECTRUM FOR 5G.

Even as the Administration considers the NSS, the race to 5G is on. There is little question that the economic stakes of the race to 5G are high. In the United States, 5G is expected to create three million new jobs, generate \$275 billion in new investment, and produce \$500 billion of economic growth.¹¹ The opportunity is there. But, the global race to 5G is in full throttle: as FCC Chairman Pai observed, “[o]ther countries, especially China, are eager to seize these opportunities for themselves, confident that the first mover will claim the bulk of the

¹¹ CTIA, *The Global Race to 5G*, at 2 (Apr. 2018), <https://api.ctia.org/wp-content/uploads/2018/04/Race-to-5G-Report.pdf>.

benefits (as happened when the United States led on 4G).¹² Indeed, a recent report by GSMA noted, “[c]ompared to 4G, more markets are set to be involved in early 5G deployments around the world.”¹³ The U.S. should act *now* if it is to maintain global leadership and reap the benefits of winning the race to 5G.

Projected demand for 5G can only be met with new spectral resources. The most important near-term step the U.S. can take regarding 5G is to make more spectrum available for it. Demand projections bear this out. The November 2018 *Ericsson Mobility Report* forecasts that over half (55 percent) of all mobile subscriptions in North America will be 5G by 2024.¹⁴ The *Report* also found that North America continues to have the highest monthly data traffic per smartphone, reaching 8.6 gigabytes in 2018, and this figure is expected to rise to 50 gigabytes by the end of 2024.¹⁵ And, by 2024, total mobile data traffic in North America is expected to exceed 19 exabytes per month (roughly six times the amount of traffic in 2018).¹⁶ Not surprisingly, U.S. wireless operators have concluded that “expectations for long-term mobile data traffic outweigh the capacity that can be provided with existing spectrum holdings.”¹⁷

¹² Ajit Pai, *5G is in reach. But only if we set the right policies.*, Wash. Post (Sept. 26, 2018), https://www.washingtonpost.com/opinions/5g-is-in-reach-but-only-if-we-set-the-right-policies/2018/09/26/9d5c322e-c1c7-11e8-8f06-009b39c3f6dd_story.html?utm_term=.93c577a5f57b.

¹³ GSMA, *The 5G era in the US*, at 32 (2018), <https://www.gsma-intelligence.com/research/?file=4cbbdb475f24b3c5f5a93a2796a4aa28&download>.

¹⁴ Ericsson, *Ericsson Mobility Report*, at 13 (Nov. 2018) (“*Ericsson Mobility Report*”), <https://www.ericsson.com/en/mobility-report/reports/november-2018>.

¹⁵ *Id.* at 16.

¹⁶ *Id.* at 17.

¹⁷ GSMA, *The 5G era in the US*, at 34 (2018) (“*GSMA 5G Report*”), <https://www.gsma-intelligence.com/research/?file=4cbbdb475f24b3c5f5a93a2796a4aa28&download>.

The U.S. should make more mid-band spectrum available for 5G. A successful strategy for 5G requires access to mid-band spectrum, which offers a balance of low-band capabilities (favorable signal range and indoor penetration) and higher-band benefits (wider channelization enabling increased capacity, faster speeds, and lower latency). Presently, spectrum in the 3.7-4.2 GHz band (“C-Band”) is the *only* mid-band spectrum under consideration for exclusive-use, flexible-rights macro 5G operations.¹⁸ Satellite incumbents’ current proposal to repurpose 180 megahertz (200 megahertz less a 20 megahertz guardband) of the C-Band spectrum is substantially less than what is required for multiple wireless carriers to sustain gigabit-level speeds. As Ericsson has also urged previously, the FCC should incorporate a licensed element into the 6 GHz band.¹⁹ Ericsson also commends NTIA for its study of the repurposing of the 3450-3500 MHz band.²⁰ The United States should prioritize identifying and making available as

¹⁸ See *Expanding Flexible Use of the 3.7 to 4.2 GHz Band*, Order and Notice of Proposed Rulemaking, 33 FCC Rcd 6915 (2018). While Ericsson supports the FCC’s 3.5 GHz Citizens Broadband Radio Service (“CBRS”) – and applauded the FCC’s recent Report and Order modifying the Priority Access Licenses (“PALs”) to enhance investment and innovation in the band – the rules continue to limit the 3.5 GHz band’s utility for macro 5G deployments. Among them, as the Report and Order observed, the transmit power levels are “significantly lower” than in other bands due to coexistence concerns. *Promoting Investment in the 3550-3700 MHz Band*, Report and Order, FCC 18-149 ¶ 65 (rel. Oct. 24, 2018).

¹⁹ Reply Comments of Ericsson, FCC GN Docket No. 18-122, at 5 n.15 (filed Dec. 11, 2018). Further, Ericsson urges policymakers to make the federal spectrum at 7-8 GHz available for 5G in the near term and to develop a longer term plan for repurposing the remaining mid-band spectrum through 24 GHz. See Comments of Ericsson, FCC GN Docket No. 18-122, at 8 (filed Oct. 29, 2018).

²⁰ See David J. Redl, Assistant Secretary of Commerce for Communications and Information, “NTIA Identifies 3450-3550 MHz for Study as Potential Band for Wireless Broadband Use” (Feb. 26, 2018), <https://www.ntia.doc.gov/blog/2018/ntia-identifies-3450-3550-mhz-study-potential-band-wireless-broadband-use>.

much mid-band spectrum as possible for 5G to ensure that it does not fall behind other countries on this issue.²¹

III. THE NATIONAL SPECTRUM STRATEGY SHOULD ADOPT A FRAMEWORK THAT ESTABLISHES A ROBUST SPECTRUM PIPELINE.

Federal spectrum. Ericsson supports the Spectrum PM’s directive that executive departments and agencies report on their anticipated future spectrum requirements, and that they “initiate a review of their current frequency assignments and quantification of their spectrum usage.”²² As a general rule, sufficient information should be made public to allow an assessment of federal usage and the extent to which federal spectrum might be repurposed.

Through this process, the U.S. government should identify opportunities for commercial operations while maintaining federal use – be it, for example, where federal spectrum is unused, or where multiple federal spectrum systems can be combined (*e.g.*, multifunction radars), or where federal needs can be met by using commercial services (including 5G), or where federal

²¹ For example, South Korea recently completed its 3.5 GHz auction. Monica Allevan, *South Korea wraps 5G auction for 3.5, 28 GHz*, FierceWireless (June 20, 2018), <https://www.fiercewireless.com/wireless/south-korea-wraps-5g-auction-for-3-5-28-ghz>. China’s regulatory authority has committed to release 100 megahertz of mid-band spectrum per operator, with a focus on 3.4-3.6 GHz. CTIA, *The Global Race to 5G*, at 8 (Apr. 2018), <https://api.ctia.org/wp-content/uploads/2018/-04/Race-to-5G-Report.pdf>; Dylan Bushell-Embling, *China edges ahead in 5G race*, telecomasia.net (Apr. 17, 2018), <https://www.telecomasia.net/content/china-edges-ahead-5g-race>. See also Asha Keddy, *US must respond to increasing global competition*, The Hill (Sept. 6, 2018), <https://thehill.com/opinion/technology/404405-us-must-respond-to-increasing-5g-global-competition> (“A recent study by Deloitte states that ‘China and other countries may be creating a 5G tsunami, making it near impossible to catch up.’ Most critically, these nations are taking steps to open up bigger slices of the ‘mid-band’ spectrum to 5G. Doing so enables both the speed and range needed for networks based on this fast-emerging, next-generation technology.”).

²² Spectrum PM, Section 2(a).

spectrum use can be accommodated via other technologies (*e.g.*, fiber connections).²³ The U.S. government should conduct spectrum reviews on a recurring basis to make sure that all information about federal use of spectrum is as current as possible.

Lastly, the Administration should expedite the repurposing process by urging Congress to consider additional incentives for agencies directed to consider spectrum use and repurposing. For example, Congress should authorize the FCC and NTIA to pursue incentive auctions where federal incumbents could participate and benefit from proceeds.

Non-federal spectrum. The U.S. should continue to promote incentives for efficient and effective repurposing of non-federal spectrum, especially those that lead to exclusive, flexible-use spectrum licenses. The appropriate means of repurposing spectrum will be a function of the type of service involved, the number of incumbents who must be cleared and other factors. Two-sided auctions and secondary markets should be considered where they would expedite the repurposing process.

Spectrum should be globally harmonized. Globally harmonized spectrum allocations result in a broader ecosystem for technology, equipment, and engineering expertise, leading to economies of scale, lower costs for deployment, more rapid roll-out of new services, and enhanced competition among suppliers to the U.S. and global markets. The benefits of harmonization can also be derived from conforming to “tuning ranges,” not necessarily identical spectrum allocations. A tuning range includes adjacent or nearly-adjacent bands in which equipment can be configured to operate over multiple bands, *i.e.*, they are within the same “tuning range.” Such operational flexibility may sometimes involve radio equipment that

²³ *See id.*, Section 1 (“Federal agencies must thoughtfully consider whether and how their spectrum-dependent mission needs might be met more efficiently and effectively, including through new technology and ingenuity.”).

operates across a superset of band allocations over several regulatory jurisdictions, but may also entail using specific hardware configurations that are tailored for one or more markets. So, when considering spectrum allocations for 5G, policymakers should consider not only frequencies that can be allocated domestically, but also the possibilities provided by such global tuning range solutions. Additionally, it is especially useful for regulations on power and emissions to be compatible across markets, as a thoughtful approach to such regulation can improve the ability to field equipment with similar purpose across the globe.

A long-term pipeline of spectrum will serve the public interest. Given how long it takes to identify and repurpose spectrum, a pipeline will enable access to spectrum in a well-considered and timely fashion. The NSS should thus endorse the creation of a spectrum “pipeline” along the lines of what is proposed in the AIRWAVES Act.²⁴ That legislation would, among other things, establish a timeline for auctioning a series of critical low-, mid-, and high-bands, including those already identified by the federal government. As CTIA observed, “[k]nowing when and what spectrum will be auctioned creates certainty, encourages investment, and allows wireless carriers to plan and build their 5G networks to maximize efficiency and robustness. . . . A clear pipeline of spectrum auctions can also fund much-needed upgrades to agency systems, support government priorities, and reduce the deficit”²⁵

IV. THE EXCLUSIVE USE, FLEXIBLE RIGHTS LICENSING MODEL SHOULD REMAIN THE PREFERRED SPECTRUM ACCESS FRAMEWORK BUT THE NATIONAL SPECTRUM STRATEGY SHOULD SET GUIDEPOSTS FOR SPECTRUM SHARING, WHERE APPROPRIATE.

Licensing of spectrum on an exclusive use basis, combined with flexible rights, has been instrumental in spurring investment and innovation. For years, the FCC has licensed

²⁴ See, e.g., S.1682, <https://www.congress.gov/bill/115th-congress/senate-bill/1682>.

²⁵ <https://www.ctia.org/news/the-airwaves-act-policy-brief>.

spectrum on an exclusive basis and afforded wireless licensees the right to use their spectrum flexibly. This combination offers wireless providers certainty that their investments will not be compromised by interference, and flexibility to adjust their service offerings as necessary to meet changing market demand. The results speak for themselves: wireless capital expenditures have exceeded \$226 billion since 4G networks were launched in 2010,²⁶ and, as noted above, 5G is expected to generate \$275 billion in new investment. Simply put, affording wireless providers exclusive use with flexible rights has been an enormous success and should remain the preferred spectrum access model for wireless services.

*Spectrum sharing will be inevitable in some cases, and should be governed by certain spectrum policy management principles.*²⁷ Notwithstanding the value of the exclusive use, flexible rights spectrum access model, it is inevitable that in some cases spectrum sharing among incumbents and newcomers will be required to enable new opportunities. In these situations, the U.S. should apply certain spectrum policy management principles and require performance of certain tasks – some of which is derived from the CSMAC 5G Report,²⁸ including the following:

- Develop sharing rules that allow robust operations yet are as simple as possible to permit markets to develop and efficient technologies to evolve. For example, the complex sharing model adopted for the 3.5 GHz band (three tiers of operations with access controlled by a Spectrum Access System (“SAS”) and Environmental Sensing Capability), while an interesting experiment, may not be the most useful framework for other bands. In particular, the requirement to send a probe or a “heartbeat” to the SAS, and the prospect that spectrum assignments can be revoked, makes such spectrum assignments particularly unsuitable for scenarios

²⁶ CTIA, “The State of Wireless,” at 12 (2018), https://api.ctia.org/wp-content/uploads-/2018/07/CTIA_State-of-Wireless-2018_0710.pdf.

²⁷ Unlicensed, of course, contributes significantly to the wireless ecosystem but our focus in these comments is licensed operations.

²⁸ Commerce Spectrum Management Advisory Committee (CSMAC), 5G Subcommittee, Final Report, at 21 (Nov. 17, 2017), https://www.ntia.doc.gov/files/ntia/publications/5g_subcommittee_final_report_2017.pdf.

that depend on high availability and reliability, such as manufacturing and industrial process control.

- Nonetheless, the use of automated access to spectrum, particularly automated systems, must be flexible and in accordance with evolving communication requirements and market needs. Such systems should enable security and performance monitoring, providing assurance to ongoing, incumbent operators that their networks will not be compromised.
- Promote efforts and develop a list of information that is needed for interference mitigation that would improve sharing. This list should include information about the legacy waveform and operations to enable the design and development of efficient sharing approaches, and the information needed to coexist.
- Spur greater efficiency – for example, having to protect U.S. government receivers that are decades old creates inefficiencies and additional costs.
- When analyzing sharing potential, use probabilistic risk assessment rather than worst-case analysis (*i.e.*, focusing on the one hazard with the most severe consequence, regardless of its likelihood) as the basis for determining sharing frameworks.

V. THE NATIONAL SPECTRUM STRATEGY SHOULD PRIORITIZE SPECTRUM EFFICIENCY IN BOTH THE COMMERCIAL AND GOVERNMENT SECTORS.

While it is true that “[t]echnological innovation in spectrum usage . . . occurs in both the private and public sectors,”²⁹ Ericsson submits that development of commercial telecommunications technologies now outpaces that of government technologies.

Technology transfer has shifted direction. Thus, Ericsson supports the Spectrum PM’s directive that “[t]he United States Government shall also continue to encourage investment and adoption by Federal agencies of commercial, dual-use, or other advanced technologies that meet mission requirements, including 5G technologies.”³⁰ Indeed, whenever feasible, Federal agencies should use commercial standards and services and adopt commercial

²⁹ Spectrum PM, Section 1.

³⁰ *Id.*

spectral efficiencies. In addition, as commercial and government users discuss the NSS, they should consider working in partnership to jointly identify technical frameworks that promote efficiency in commercial and government networks (*e.g.*, identification of better, standardized path loss models).

VI. CONCLUSION

Ericsson fully supports the Administration's effort to develop a National Spectrum Strategy in accordance with the Spectrum PN, and urges that the NSS incorporate the recommendations set forth above.

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