<div align="center">

Before the
NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION
Washington, DC 20230

</div>

In the Matter of	)
	)
Public Wireless Supply Chain Innovation	) Docket No. 221202-0260
Fund Implementation	) RIN 0693-XC053
	)

<div align="center">

COMMENTS OF T-MOBILE USA, INC.

</div>

T-Mobile USA, Inc. ("T-Mobile")[1] submits these comments in response to the above-referenced Notice and Request for Comment ("Notice") issued by the National Telecommunications and Information Administration ("NTIA"), the replies to which will inform NTIA's development of Notices of Funding Opportunity ("NOFOs") to implement the Public Wireless Supply Chain Innovation Fund ("Innovation Fund").[2] In developing NOFOs, NTIA should focus on the broad goals of the Innovation Fund and not narrowly on projects that promote Open Radio Access Network ("Open RAN") technology over all others. Open RAN-related projects should address identified challenges in the implementation of those protocols.

I. INTRODUCTION

In creating and later appropriating money for the Innovation Fund,[3] Congress established broad goals, such as enhancing U.S. 5G competitiveness and equipment security, to promote

---

[1] T-Mobile USA, Inc. is a wholly-owned subsidiary of T-Mobile US, Inc., a publicly traded company.

[2] *See Public Wireless Supply Chain Innovation Fund Implementation*, Notice and Request for Comment, National Telecommunications and Information Administration, 87 Fed. Reg. 76182 (Dec. 13, 2022) ("Notice").

[3] *See* William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021, 47 U.S.C. § 906(a)(1) (2022) (authorizing the Innovation Fund); CHIPS and Science Act of 2022, Pub. L. No. 117-167, Div. A, § 106, 136 Stat. 1392 (appropriating $1.5 billion for the Innovation Fund).

multi-vendor environments and supply chain resilience.[4/] T-Mobile strongly supports that Congressional directive, which can help create a larger and more diverse product ecosystem, increase competition, and reduce over-reliance on a limited number of vendors – particularly vendors determined to pose national security risks, like Huawei Technologies Company and ZTE Corporation. NOFOs and grants awarded through the Innovation Fund should align with these broad goals.

To achieve this alignment, the NOFOs and grants should not focus principally on Open RAN technologies, particularly based on Open RAN's proven limitations and the timeframe anticipated for deployment. As T-Mobile and others have demonstrated to NTIA, the Federal Communications Commission ("FCC"), and the Department of Defense,[5/] Open RAN is still a nascent technology. Because deployment of Open RAN protocols are problematic in networks that are mature or already being built, NTIA should refrain from favoring applications for Innovation Fund grants that would delay or hamper 5G's progress and the future deployment of 6G by requiring or prioritizing the use of Open RAN.

Accordingly, in developing its NOFOs for the Innovation Fund grant program, NTIA should (i) *not* limit Innovation Fund grant applications to only those that will support Open RAN deployment, particularly for 5G; (ii) award grants to projects that promote the multi-vendor environment for current non-Open RAN 5G deployments; and (iii) focus Open RAN grant

---

[4/]   *See* 47 U.S.C. § 906(a)(1)(C).

[5/]   *See, e.g.*, Reply Comments of T-Mobile USA, Inc., GN Docket No. 21-63, at 2-3 (filed May 28, 2021) ("T-Mobile FCC Open RAN Reply Comments"); Reply Comments of CTIA, GN Docket No. 21-63, at 11 (filed May 28, 2021); Comments of T-Mobile USA, Inc., GN Docket No. 21-63, at 8-12 (filed Apr. 28, 2021) ("T-Mobile FCC Open RAN Comments"); Comments of the Open RAN Policy Coalition, GN Docket No. 21-63, at 4 (filed Apr. 28, 2021); Comments of AT&T, GN Docket No. 21-63, at 7 (filed Apr. 28, 2021); Comments of T-Mobile USA, Inc., Docket No. 210105-0001, at 9-10 (filed Feb. 21, 2021).

awards on applicants proposing to address the currently-recognized limitations of Open RAN protocols, such as security vulnerabilities.

II.   STATE OF THE INDUSTRY

In order to understand how to best prioritize and fund Innovation Fund projects, NTIA seeks comment on the current state of the telecommunications industry.[6] NTIA also seeks comment on the principal challenges limiting the adoption and deployment of Open RAN, the challenges experienced with incorporating Open RAN into existing networks (*i.e.*, brownfield deployments), the ongoing public and private initiatives that are relevant to the Innovation Fund, and the ways in which NTIA can complement existing initiatives with grant funding.[7]

The wireless industry is rapidly implementing 5G across the country.[8] As recently reported by the FCC, each nationwide wireless provider's 5G network now covers at least 67 percent of the U.S. population.[9] And studies estimate that by 2025, 5G will represent 64 percent of all wireless connections.[10] T-Mobile, in particular, continues to expand its 5G footprint. For example, T-Mobile recently announced that its Extended Range 5G now reaches 323 million people, and its Ultra Capacity 5G now reaches 260 million people, covering nearly everyone in

---

[6]   *See* Notice at 76184.

[7]   *See id.* (questions 1, 1a, 2, and 2b).

[8]   *See, e.g.*, *5G Year in Review: 10 Major Milestones of 2022*, VERIZON (Dec. 13, 2022), https://www.verizon.com/about/news/5G-ultrawideband-2022-year-review; Gordon Mansfield, *Using Streetlights to Boost 5G Deployment in Cities*, AT&T (Feb. 25, 2022), https://about.att.com/innovationblog/2022/streetlights-to-boost-5g-deployments.html.

[9]   *See 2022 Communications Marketplace Report*, FCC 22-103, ¶ 64 (rel. Dec. 30, 2022) ("*2022 Communications Marketplace Report*").

[10]   *See* GSMA, THE MOBILE ECONOMY – NORTH AMERICA 2022, 11 (2022), https://www.gsma.com/mobileeconomy/wp-content/uploads/2022/09/290922-Mobile-Economy-North-America-2022.pdf.

the U.S.[11/] T-Mobile also recently launched its Ultra Capacity 5G on its 5G standalone network.[12/]

That is why NTIA should not focus grant funds principally on Open RAN, which is still in its infancy, with full development of the technology likely years away. Indeed, forecasts show that Open RAN will only comprise 15 percent of the 2G-5G RAN market by 2026.[13/] Some have estimated that by 2030, Open RAN will be used in only 40 percent of radio systems around the world.[14/] While Open RAN may show promise,[15/] more work remains before Open RAN is widely deployed and adopted. And by the time that Open RAN is able to be widely deployed, the opportunity to address interoperability of 5G devices, which Congress intended the Innovation Fund to assist, will have already passed.

Open RAN also has significant shortcomings that must be overcome by industry before any widespread adoption. For example, one of the first Open RAN networks deployed in the U.S. was decommissioned last year due to insufficient demand and the inability to "obtain

---

[11/]   *See* News Release, *T-Mobile Expands Leading 5G Network with Additional Coverage and Capacity*, T-MOBILE (Dec. 12, 2022), https://www.t-mobile.com/news/network/t-mobile-expands-leading-5g-network-with-additional-coverage-and-capacity; News Release, *T-Mobile's 5G Network Continues to Lead the Nation*, T-MOBILE (Oct. 17, 2022), https://www.t-mobile.com/news/network/t-mobiles-5g-continues-nationwide-lead.

[12/]   *See* News Release, *T-Mobile Lights Up Standalone Ultra Capacity 5G Nationwide*, T-MOBILE (Nov. 14, 2022), https://www.t-mobile.com/news/network/t-mobile-lights-up-standalone-ultra-capacity-5g-nationwide.

[13/]   *See* Mike Dano, *One of America's First Open RAN Networks is Being Dismantled*, LIGHT READING (Apr. 28, 2022), https://www.lightreading.com/open-ran/one-of-americas-first-open-ran-networks-is-being-dismantled/d/d-id/777101 ("Dano Apr. 2022 Article"); *see also* Monica Alleven, *Integration Challenges Still Cloud Open RAN: Special Report*, FIERCE WIRELESS (Mar. 24, 2022, 12:42 PM), https://www.fiercewireless.com/5g/open-ran-challenges-include-single-vendor-question-special-report ("'[T]he timing of large-scale [Open RAN] adoption . . . is some time away.'").

[14/]   *See* Mike Dano, *The Growing Pains of Open RAN*, LIGHT READING (Dec. 9, 2022), https://www.lightreading.com/open-ran/the-growing-pains-of-open-ran-/a/d-id/782247.

[15/]   *See 2022 Communications Marketplace Report* ¶ 379 ("Operators around the world are increasingly considering using Open RAN to upgrade their networks to 5G.").

compatible radios due to vendors' minimum volume purchasing requirements."[16] And, as

T-Mobile has pointed out elsewhere,[17] Open RAN is difficult to implement in brownfield

deployments. Many existing networks are typically not compatible with Open RAN standards,

making integration between Open RAN technologies and networks already being deployed

challenging, if not impossible.[18] Similarly, complexities in Open RAN system integration must

be addressed.[19] Applications awarded Innovation Fund grants should therefore focus less on

integrating Open RAN with 5G and more on solutions to identified Open RAN limitations that

can be incorporated into future technologies, like 6G.

In addition, the wireless industry is not focusing solely on Open RAN. To the contrary, it

is evaluating a variety of means to achieve open interfaces, including through industry groups

such as the 3rd Generation Partnership Project ("3GPP").[20] In fact, significant 5G innovation

takes place within 3GPP that can be employed regardless of the architecture (*i.e.,* Open RAN or

otherwise). Focusing the distribution of funds solely on Open RAN will unnecessarily ignore

broader avenues through which innovation is occurring. Indeed, aside from the unproven cost

---

[16]   Dano Apr. 2022 Article.

[17]   *See* T-Mobile FCC Open RAN Comments at 10-11.

[18]   *See* Iain Morris, *Open RAN is Falling a Long Way Short of its Promise*, LIGHT READING (Sept. 12, 2022), https://www.lightreading.com/open-ran/open-ran-is-falling-long-way-short-of-its-promise/a/d-id/780314 ("There is still no such thing as 'plug and play'. . . . Instead, operators and vendors spend weeks, months or even years doing integration trials and checks away from or on a tiny part of the main commercial network.").

[19]   *See Open RAN 101–Integration and Beyond: Why, What, When, How? (Reader Forum)*, RCR WIRELESS (July 23, 2020), https://www.rcrwireless.com/20200723/opinion/readerforum/open-ran-101-integration-and-beyond-why-what-when-how-reader-forum ("To integrate Open RAN, a new approach is needed, not from vertically integrated and hardware-centric companies, but from a software-driven, open and open-minded ecosystem of hardware vendors software vendors, system integrators, tower companies, real estate owners, regulators, industry bodies and mobile operators.").

[20]   *See* Rene Summer, *Mobile Radio Access Networks: What Policy Makers Need to Know*, ERICSSON BLOG (Sept. 17, 2020), https://www.ericsson.com/en/blog/2020/9/ran-what-policy-makersneed-to-know ("Ericsson Mobile Radio Access Networks Blog").

savings that may result from Open RAN deployment, there is no evidence that there are operational performance benefits over non-Open RAN solutions that will drive providers to Open RAN. That will be particularly true if, as appears to be occurring, there is consolidation in the marketplace for Open RAN equipment, which may limit the cost benefits of an Open RAN multi-vendor marketplace. The Innovation Fund should therefore also support efforts taken through 3GPP and other industry groups that address identified multi-vendor and interoperability issues.

III.   TECHNOLOGY DEVELOPMENT AND STANDARDS

To maximize the impact of Innovation Fund grant awards, NTIA seeks comment on the maturity of Open RAN technology and the development of related standards.[21/] In particular, NTIA asks whether there are 5G and Open RAN standards environments that are able to produce stable and market-ready products.[22/]

As noted above, 3GPP is already evaluating open interfaces, and it has developed protocols and standards for mobile services that include open interfaces.[23/] Those standards enable multi-vendor deployment across different sites and multi-vendor deployments at the same site. 3GPP has also specified several open interfaces, like the F1 interface between a distributed unit and a central unit in the RAN. These standards are already leading to 5G network interoperable products.[24/] The Innovation Fund should therefore not be limited only to Open RAN deployments. Instead, it should support other industry-led efforts, such as 3GPP activities.

[21/]   *See* Notice at 76184.

[22/]   *See id.* (question 7).

[23/]   *See* Ericsson Mobile Radio Access Networks Blog.

[24/]   *See id.*

The Innovation Fund can support industry-led efforts by, for example, providing funding for "plugfests." It can also support other activities that will help the continued deployment of 5G networks by, for instance, promoting multi-vendor interoperability testing and debugging. Moreover, the Innovation Fund can help fund private research and development efforts that can further lead to industry-led protocols and standards.

IV. INTEGRATION, INTEROPERABILITY, AND CERTIFICATION

NTIA seeks comment on the effectiveness of certification programs and whether those programs will affect commercial adoption and deployment of Open RAN technologies.[25] It also asks whether certification is necessary and if there are more effective alternatives to certification.[26]

Industry has historically and successfully implemented certification protocols without government involvement. That has led to the successful deployment of new generations of wireless networks in the U.S.[27] While standardization activities can help drive marketplace development and certification programs can help foster standardization and interoperability, those activities must be privately-led to be effective, timely and future-proof. As T-Mobile and others have pointed out, government promotion of technology solutions, particularly those that remain under development, is contrary to the public interest.[28] Therefore, the Innovation Fund need not be used to develop government-directed certification or similar programs that could be

---

[25]   *See* Notice at 76184.

[26]   *See id.* (questions 11, 11a, and 12a).

[27]   The U.S. is a global leader in 5G deployment and adoption because the wireless industry "recognize[s] the power of free market competition to drive innovation and investment." Meredith Attwell Baker, *Maintaining America's 5G Leadership*, CTIA BLOG (Feb. 25, 2022), https://www.ctia.org/news/maintaining-americas-5g-leadership.

[28]   *See, e.g.*, T-Mobile FCC Open RAN Reply Comments at 5; Comments of Ericsson, GN Docket No. 21-63, at 10, 31 (filed Apr. 28, 2021).

interpreted as mandates. Indeed, government-led certification would likely be difficult to change, causing once-current Open RAN interfaces, for example, to become frozen in place and quickly outdated. And, as once-current Open RAN interfaces become outdated, customers of providers required to use Open RAN could potentially receive outdated service. Instead of using Innovation Fund grants to develop government-directed certification or similar programs, they should be used to support industry-led efforts to develop certification programs for interoperability.

V.   TRIALS, PILOTS, USE CASES, AND MARKET DEVELOPMENT

NTIA seeks comment on the foreseeable use cases for Open RAN, including for 5G networks, and the types of trials, use cases, and studies that will help achieve the broad goals identified by Congress and inform the NOFOs NTIA will later publish and administer.[29] NTIA also asks which use cases, testbeds, trials, and pilot studies should be prioritized.[30] When establishing the Innovation Fund, Congress noted that grants should be administered to support a range of activities, including, "[m]anaging integration of multi-vendor network environments," "[p]romoting and deploying security features enhancing the integrity and availability of equipment in multi-vendor networks," and "[p]romoting and deploying network function virtualization to facilitate multi-vendor interoperability and a more diverse vendor market" – not solely Open RAN.[31]

Consistent with that Congressional directive, NTIA should evaluate a broad array of technologies related to multi-vendor network environments and resilient supply chains and ensure that the NOFOs are not focused on any particular technology or use case. Accordingly,

---

[29]   *See* Notice at 76184 (questions 13 and 14).

[30]   *See id.* (questions 13 and 14a).

[31]   47 U.S.C. § 906(a)(1)(C).

trials, use cases, feasibility studies, and proofs of concept should similarly focus on (i) a wide variety of technologies being used to deploy current 5G networks; and (ii) Open RAN technologies that may be used in future greenfield networks, with an emphasis on identified vulnerabilities, such as security, of those technologies. Test beds that evaluate network interfaces and interoperability should also be supported.

VI. SECURITY

To inform how NTIA incorporates security into future NOFOs, NTIA seeks comment on how the Innovation Fund can strengthen the security of Open RAN.[32] Congress appropriately, as NTIA notes, made security "a key aim of the Innovation Fund."[33] And, as demonstrated by the FCC's "rip-and-replace" program, insecure equipment in today's communications networks is far-reaching and costly to address. Indeed, the FCC has so far distributed nearly $41 million of the $1.9 billion allocated to the "rip-and-replace" program to fund the removal of insecure equipment,[34] and it has notified Congress that it needs an additional $3 billion to fully cover the costs of the program.[35]

Open RAN has the potential to heighten the risk of security threats because Open RAN systems consist of multiple independent components – including interfaces, functions, and functional splits – from various vendors in any one network. Any one of these components may

---

[32]   *See* Notice at 76185 (question 19).

[33]   *Id.* (citing 47 U.S.C. § 906(a)(1)(C)(vi)).

[34]   *See* SECURE AND TRUSTED COMMUNICATIONS NETWORKS REIMBURSEMENT PROGRAM REPORT, FEDERAL COMMUNICATIONS COMMISSION WIRELINE COMPETITION BUREAU 8 (2023), https://docs.fcc.gov/public/attachments/DOC-390614A1.pdf; 47 U.S.C. § 1603(d)(5)(A).

[35]   *See* Letter from Jessica Rosenworcel, Chairwoman, FCC, to the Honorable Maria Cantwell, the Honorable Roger Wicker, the Honorable Cathy McMorris Rodgers, the Honorable Rosa DeLauro, the Honorable Kay Granger, the Honorable Patrick J. Leahy, the Honorable Richard C. Shelby, the Honorable Frank Pallone (Feb. 4, 2022), https://docs.fcc.gov/public/attachments/DOC-384088A1.pdf.

introduce a security vulnerability. Because Open RAN inherently presents security concerns,[36/] the Innovation Fund can play an important role in strengthening Open RAN security. For example, each grant recipient can be required to demonstrate how it has considered security in developing its project, noting particularly how the project addresses the security challenges created by an Open RAN multi-vendor environment. Ensuring that Innovation Fund grant recipients address security concerns when receiving grant funds will help secure Open RAN systems prior to deployment and avoid costly fixes that may be required after it is too late.

VII. PROGRAM EXECUTION AND MONITORING

As NTIA recognizes, "the Innovation Fund is a historic investment in America's 5G future."[37/] NTIA therefore seeks comment on how it can guarantee that a diverse group of stakeholders apply and compete for funding through the program.[38/] As noted above, one way in which it can achieve this is by not prioritizing or expressing a preference for Open RAN or the implementation of Open RAN in 5G networks until the technology matures. Instead, NTIA should focus on projects seeking to generally enhance interoperability in the multi-vendor environment for 5G and successor wireless technologies. This would help level the playing field among equipment providers, including small- and medium-sized entities that may have been unable to compete in the marketplace because of a lack of funding.

[36/]   *See* OPEN RADIO ACCESS NETWORK SECURITY CONSIDERATIONS, CYBERSECURITY AND INFRASTRUCTURE SECURITY AGENCY AND NATIONAL SECURITY AGENCY 7 (2022), https://www.cisa.gov/sites/default/files/publications/open-radio-access-network-security-considerations_508.pdf ("Open RAN architecture will introduce more complexity due to the increased number of vendors and disaggregation of traditional network functions. These Open RANs are comprised of components that vary based on their specific function or use case they support.").

[37/]   Notice at 76185.

[38/]   *See id.* (question 22).

NTIA could, for example, award grants to entities that will broadly assess interoperability and multi-vendor environments, both in current networks and future networks, without mandating particular outcomes. Such an approach would not only encourage a wide array of participants, but it is also particularly important to utilize because interoperability and multi-vendor environments are key components of 5G, especially standalone 5G,[39] and future wireless technologies.

NTIA also seeks comment on how it can ensure that projects awarded grant funds through the Innovation Fund promote U.S. 5G competitiveness.[40] Because the Innovation Fund, at its core, is intended to promote U.S. competitiveness in the wireless technology supply chain,[41] Innovation Fund grant award recipients should be either U.S.-based or have significant U.S. operations. For the same reasons, activities conducted pursuant to Innovation Fund grants should be located in the U.S. Implementing these requirements for grant award recipients and program activities will help secure continued U.S. leadership in wireless technologies.

VIII. CONCLUSION

T-Mobile supports the goals of the Innovation Fund. However, NTIA should recognize that Open RAN is only in the early stages of development, and it is unclear when Open RAN will be deployed and adopted on a large scale. NTIA should therefore refrain from requiring applicants seeking funding through the Innovation Fund to focus their projects on Open RAN, especially Open RAN for 5G. Rather, the Innovation Fund should focus on improving multi-vendor environments and strengthening the supply chain, without mandating particular

---

[39]   *See* News Release, *T-Mobile Achieves Significant 5G Firsts with Cisco, Ericsson, MediaTek, Nokia, OnePlus and Qualcomm*, T-MOBILE (May 4, 2020), https://www.t-mobile.com/news/network/tmobile-achieves-significant-5g-firsts.

[40]   *See* Notice at 76185 (question 25).

[41]   *See* 47 U.S.C. § 906(a)(1)(C)(i).

technologies and outcomes. This approach will benefit both current technologies and those

deployed in the future.

<div style="margin-left:50%;">

Respectfully submitted,

/s/ *Steve B. Sharkey*
Steve B. Sharkey
John Hunter

T-MOBILE USA, INC.
601 Pennsylvania Avenue, N.W.
Suite 800
Washington, DC 20004
(202) 654-5900

</div>

January 27, 2023