

**Before the
DEPARTMENT OF COMMERCE
NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION
Washington, DC 20230**

Request for Comment)
)
CHIPS and Science Act of 2022) Docket No. 221202-0260

COMMENTS OF CORNING INCORPORATED

I. INTRODUCTION AND SUMMARY

Corning Incorporated (“Corning”) welcomes the opportunity to respond to the Request for Comment in which the National Telecommunications and Information Administration (“NTIA”) seeks comment on NTIA’s development and implementation of the Public Wireless Supply Chain Innovation Fund (“Innovation Fund”).

The United States has made a commitment to spur development and adoption of open, interoperable, and standards-based networks through the creation and funding of the Innovation Fund. The Innovation Fund was authorized under the FY 2021 National Defense Authorization Act and funded by the CHIPS and Science Act of 2022. This is not only an opportunity to support development of critical technology but also to establish the U.S. as a global leader in the innovation and deployment of cutting-edge wireless advancements.

The future of ORAN and our communications network is a matter of national security. As such, the promotion of U.S. development isn’t just economically beneficial but necessary for protecting critical assets from potential vulnerabilities.

Corning’s comments below reflect our position as a leader in wireless solutions. In fact, Corning has the distinction of creating the first U.S.-developed ORAN solution that’s entered a U.S. Tier 1 operator’s lab. With this perspective, we are committed to continuing to be a part of the U.S. taking a leadership role in the future of this technology by intensifying its research and development initiatives around 5G software solutions.

II. BACKGROUND

For nearly 170 years, Corning has applied its unparalleled expertise in specialty glass, ceramics, and optical physics to develop products that have created new industries and transformed people’s lives. Corning is the inventor and an industry-leading supplier of optical fiber for cable and connectivity, which is a foundational aspect of next-generation networks and is a leader in developing other critical components for today’s telecommunications networks.

Corning has a long history of innovation. In the late 1870’s, when Thomas Edison needed a glass envelope for his first incandescent lamp, Corning was the glass company he turned to. By the late

1920's, as electrification was spreading across the country, Corning's Ribbon Machines pumped out two thousand light bulbs per minute. In the 1950's as the television gained popularity, Corning's cathode ray tubes were the component causing the magic images to appear. In the 1960's, as the space race gained momentum, the Mercury spacecraft, followed by the Gemini, Apollo, and the space shuttle, all used Corning for heat resistant glass windows. In 1970, Corning invented the first commercially viable low-loss optical fiber, a breakthrough innovation that changed the world and ushered in the communications revolution.

Corning continues to be a leading innovator in the development of communications infrastructure. Last year, Corning introduced the first fiber that features superior bendability, legacy fiber compatibility, and low attenuation. Corning recently developed the first all-optical converged cellular solution built on an all-optical backbone with modular service support and meeting all the wireless service needs of large-scale enterprises at a lower cost as compared to other solutions. To meet growing and evolving communications demands, Corning has continued to pioneer optical fiber, cable, connectivity, and wireless solutions.

Headquartered in Corning, New York, Corning Incorporated operates 52 facilities in the United States, including two large optical fiber manufacturing facilities and four large fiber optic cabling facilities in North Carolina, and a massive research and development ("R&D") facility, Sullivan Park, located in Corning, New York. In fact, R&D is core to Corning's DNA, and our unique innovation process is a rigorous, highly collaborative methodology that enables us to consistently—and efficiently—develop technologies that often enable entirely new markets while solving key customers' problems. Corning reinvests nearly 10 percent of its revenues into R&D, providing our scientists with the resources they need to be successful.

Currently and importantly, Corning is spearheading the development of the game-changing Open Radio Access Network (ORAN) that is redefining the RAN ecosystem for 5G. While ORAN is envisioned to be the way of the future, a balanced RAN approach will prevail in the coming few years where the proven centralized RAN (CRAN) and the new ORAN will co-exist. Increasingly, 5G will leverage an ORAN architecture, with the expectation that 6G and beyond will be based primarily on an ORAN architecture leading to vendor diversity and higher performance. Corning is actively working towards bringing high performance in-building wireless networks with ORAN to benefit all, but most notably our focus is and remains with the major U.S. cellular operators.

As part of this work, last year, Corning announced that we have developed the first U.S. developed ORAN solution that's entered a major Tier 1 U.S. operator's lab. We are looking to continue to build upon this accomplishment by establishing partnerships with other operators and continuing to expand our wireless business. Corning has always supported open interfaces and protocols and is the only RAN vendor to have achieved X2-based interoperability with all other RAN vendors. This interoperability, while outside of ORAN specifications, are a key part of 3GPP specifications that allows network operators to mix-and-match RAN vendors when it comes to deploying 5G Non-Standalone (NSA) networks. This is an example of our commitment to open networks, and how it accelerated deployments and protected operators' existing investment in 4G networks. Corning is developing architectures based on ORAN that can fundamentally support multiple operators, including private networks, in a cost-effective and secure manner. By this, we are enabling ORAN-based solutions to be deployed seamlessly

inside buildings with minimal number of radios, thereby addressing deployment cost and aesthetics simultaneously, two very important considerations for enterprises.

III. RESPONSES

Questions on the State of the Industry

3. What kind of workforce constraints impact the development and deployment of open and interoperable, standards-based RAN, such as Open RAN? How (if at all) can the Innovation Fund help alleviate some of these workforce challenges?

In the United States, there is currently a lack of a talent pool for wireless related software engineers, especially compared to other countries like China and India. For the qualified engineers that are available, there is fierce competition between companies in the tech sector to hire talent. For companies developing nascent technologies or applications, it can be very difficult to attract talent from established competitors with greater resources and benefits.

The lack of domestic talent stems from a chasm between what industry needs and what universities are focused on. There is a dire need for greater collaboration to ensure that both are working towards the same goals and addressing relevant problems. Programs should allow for students to work on real world problems to better prepare them for life beyond university.

The Innovation Fund can help by supporting collaboration models that have been effective in China and the EU. Wireless partnership research projects that are funded partially by the U.S. government, with participation from industry, will help to leapfrog U.S.-based technology for 6G and simultaneously train engineers in these wireless technologies that can create a robust talent funnel that the U.S.-based wireless industry can take advantage of. Replicating these types of programs can thus help close the gap between the U.S. workforce and these other markets which in turn will help U.S. competitiveness on Open RAN and other technologies. This will also incentivize U.S. universities to work on real-world industry problems and develop joint projects and partnerships with US-based industry players to further innovation in wireless technologies.

Questions on Trials, Pilots, Use Cases, and Market Development

13. What are the foreseeable use cases for open and interoperable, standards-based networks, such as Open RAN, including for public and private 5G networks? What kinds of use cases, if any, should be prioritized?

There are a number of different use cases that we can expect. Private network use cases that should be emphasized are applications for industries like healthcare, manufacturing, agriculture, logistics, and security applications. Solutions that provide cost-effective Open RAN based networks that simultaneously can serve public neutral host and private enterprise use-cases via the same network infrastructure should be prioritized. This will help bring down the cost of deployment of these networks and spur investment by enterprises to launch private 5G networks.

14. What kinds of trials, use cases, feasibility studies, or proofs of concept will help achieve the goals identified in 47 U.S.C. 906(a)(1)(C), including accelerating commercial deployments?

Some of the biggest impacts can come from supporting the establishment of interoperability labs and trials, including developing unified minimal requirements to qualify RAN vendors for all US-based operators should be a priority. Developing a U.S.-based common set of software and hardware requirements based on Open RAN architecture and 3GPP specifications will allow US-based vendors to leverage their R&D investment across multiple service providers and accelerate the time to qualify these solutions.

Corning has introduced ORAN-based solutions at U.S. operators labs and shown the fully integrated system to work effectively and achieved core network integration, as well as integration with other RAN vendors that would help to provide seamless 5G coverage in non-standalone mode of operation. In addition, Corning has participated in the 3rd Global Joint O-RAN/TIP/LNF Plugfest and Proof-of-Concepts held in Q4 of 2021, jointly chaired by Verizon and AT&T. The Plugfest was hosted at the TIP Community Lab on the Facebook (Meta) campus in Menlo Park, California. Here we demonstrated both our radio working with standardized ORAN test equipment as well as our ORAN software working with third-party ORAN radios.

15. How might existing testbeds be utilized to accelerate adoption and deployment?

Major U.S. Tier 1 operators currently have established labs working with vendors, such as Corning, to achieve core network integration. Utilizing these existing testbeds as part of the operator approval process, so that vendors can receive carrier approval via common testbeds, will accelerate adoption of Open RAN networks. NTIA should provide incentives for US-based entities that provide integration of different ORAN components to make a workable and deployable solution as this would help to accelerate deployments.

Questions on Program Execution and Monitoring

24. How can NTIA maximize matching contributions by entities seeking grants from the Innovation Fund without adversely discouraging participation? Matching requirements can include monetary contributions and/or third-party in-kind contributions (as defined in 2 CFR 200.1).

NTIA should consider allowing previous domestic investments that U.S. companies have already made in the last 3 years in advance of this program to be considered as eligible for matching contributions. Corning has already put significant capital towards projects consistent with several of the objectives listed in 47 U.S.C. 906(a)(1)(C) despite the current lack of a market or profitability because we recognize the importance of U.S.-established RAN vendors. Grant funds should supplement these existing, recent investments by satisfying a matching requirement for companies that have already made long term investments. Otherwise companies, such as Corning, would be at a disadvantage compared to companies who are new entrants and have waited for government funding to begin development and start to lay the foundation for U.S. leadership for 6G.

25. How can the fund ensure that programs promote U.S. competitiveness in the 5G market?

There are several ways that the Fund can promote U.S. competitiveness. First, the program should give priority to U.S. based companies with U.S. facilities and workforce for projects that will be taking place in

the U.S. While this industry is reliant on a global supply chain and technological development will require participation from global stakeholders, this Fund is also an opportunity to level the playing field and can serve as a significant boost to domestic entities.

Second, priority or incentives should be given to companies that have established relationships/partnerships or that are willing to set up relationships to source from U.S. based manufacturers and software developers. This will act as an incentive to move final assembly or manufacturing to the U.S. while still allowing for global stakeholders to participate in the program.

a. Should NTIA require that grantee projects take place in the U.S.?

The U.S. has the potential to take a global leadership role in the development of this technology. NTIA should give priority or incentives to projects that will take place in the U.S. and in particular projects that support U.S.-based software development.

Corning employs roughly 60,000 employees worldwide and has U.S. facilities in more than 15 states. Corning's wireless business has offices in Milpitas, California and Dallas, Texas where teams of software engineers are developing solutions related to wireless and ORAN.

By spurring continued growth with government funding, NTIA has the ability to support investments made by companies like Corning- allowing industry to expand projects, increase workforces, and dedicate resources to long-term initiatives.

b. How should NTIA address potential grantees based in the U.S. with significant overseas operations and potential grantees not based in the U.S. (i.e., parent companies headquartered overseas) with significant U.S.-based operations?

Priority should be given to grantees that are US-based with majority of employees with some overseas operation as opposed to non-US based companies that have some presence in the US. Given the security considerations, the development of software code for RAN development should be primarily developed and owned by U.S. entities.

For any questions related to this filing, please contact Jordan Gross, Grossjm2@corning.com.