SIA SEMICONDUCTOR INDUSTRY ASSOCIATION

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**Comments of the
Semiconductor Industry Association
on**

National Strategy to Secure 5G Implementation Plan

85 Fed. Reg. 32016 (May 28, 2020)
RIN 0660-XC04
Docket No. 200521-0144

June 25, 2020

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The Semiconductor Industry Association (SIA) is pleased to submit these comments to NTIA in response to request for comment on National Strategy to Secure 5G Implementation Plan, 85 Fed. Reg. 32016 (May 28, 2020).

SIA is the voice of the semiconductor industry, one of America's top export industries and a key driver of America's economic strength, national security, and global competitiveness. Semiconductors – the tiny chips that enable modern technologies – power incredible products and services that have transformed our lives and our economy. The semiconductor industry directly employs nearly a quarter of a million workers in the United States, and U.S. semiconductor company sales totaled $193 billion in 2019. SIA represents 95 percent of the U.S. semiconductor industry by revenue and nearly two-thirds of non-U.S. chip firms. SIA seeks to strengthen leadership of semiconductor manufacturing, design, and research by working with Congress, the Administration, and key industry stakeholders around the world to encourage policies that fuel innovation, propel business, and drive international competition. More information about SIA and the industry is available at www.semiconductors.org.

Semiconductors are instrumental components in global telecommunications infrastructure, embedded in every form of modern telecommunications hardware, from cellphones to base stations to edge computing to data servers and cloud computing. Cutting-edge semiconductor innovations are key components in the transition to 5G networks by driving advances throughout the hardware that is essential throughout the 5G infrastructure, including:
- **Modems** that connect a 5G device (cellphones, customer service equipment, automobiles, etc.) to a 5G network;
- **RF chips** used to transmit and receive 5G radio signals, both in 5G base stations and in edge devices;
- **High-performance integrated circuits** used in data centers, routers, switches, and base stations;
- **Processors** used to power base stations and devices; and

- **Analog chips** used to regulate and manage power efficiency of telecom hardware.

SIA appreciates the administration's recognition of the importance of 5G technologies to the future prosperity and security of the U.S. SIA offers the following responses to the specific questions Commerce posed in the notice.

Line of Effort One: Facilitate Domestic 5G Rollout

Question 1: *How can the United States (U.S.) Government best facilitate the domestic rollout of 5G technologies and the development of a robust domestic 5G commercial ecosystem (e.g., equipment manufacturers, chip manufacturers, software developers, cloud providers, system integrators, network providers)?*

Response 1:
An integral part of a domestic 5G commercial ecosystem is ensuring that the U.S. has a strong chip manufacturing ecosystem, including a strong industrial and innovation base. The semiconductor industry invests approximately 20% of revenue back into R&D, the second highest intensity among all sectors of the US economy, behind only the pharmaceuticals sector. As the Boston Consulting Group has highlighted, the US semiconductor industry leads today because of a virtuous cycle of innovation. "From the massive R&D effort comes superior technology and products, which in turn lead to higher market share and, typically, higher profit margins, thus refueling the virtuous cycle."[1] Continued US leadership in 5G is dependent on US companies maintaining that virtuous cycle of innovation.

While the U.S. has a stable manufacturing footprint, with commercial fabs in 17 states and semiconductors being our nation's fifth largest export, the U.S. accounts for only 12 percent of global semiconductor manufacturing capacity. Governments around the world offer generous cash grants, other subsidies, and tax incentives exceeding 40 percent of the costs of constructing and operating a fab. In considering the development of a domestic 5G ecosystem, a strong U.S. semiconductor manufacturing base is critical. While a domestically-produced semiconductor is not inherently more secure, and global supply chains have been critical to the semiconductor industry's success, a domestic manufacturing base is important in ensuring the U.S. has a proper diversity of 5G semiconductor supply. In order to build a stronger domestic semiconductor manufacturing supply chain, SIA recommends:

- **A new federal grant program that would provide grants for incentivizing new domestic semiconductor manufacturing facilities** (fabrication, assembly, test and advanced development) that align with our nation's strategic priorities. These federal grants would be in addition to state-level incentives.

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[1] https://image-src.bcg.com/Images/BCG-How-Restricting-Trade-with-China-Could-End-US-Semiconductor-Mar-2020_tcm9-240526.pdf

- **Federal funding to develop an advanced logic foundry ecosystem to address U.S. national security concerns.** This would include investments in secure design systems, assurance and security technologies, and funding for new commercial approaches to onshore fabrication for the U.S. national security community for both leading-edge logic (minimum 7nm EUV capable and below) and specialty process technologies.

- **Tax incentives for semiconductor manufacturing**, such as a refundable investment tax credit for the purchase of semiconductor manufacturing equipment, as well as fab infrastructure and capital costs.

Finally, in order to facilitate the domestic rollout of 5G technologies, the government should ensure that a mix of all three types of spectrum – low-band, mid-band, and high-band – are adequately allocated for mobile broadband and look to maximize spectrum efficiency, while also continuing to increase the allocations and assignments to support the further deployment of mobile broadband services. Additionally, policymakers should evaluate ways to streamline the regulatory process for infrastructure deployment.

In the United States, sub-6Ghz spectrum supported the initial deployment of mobile broadband service (e.g., LTE 4G systems). Recent regulatory initiatives have enabled greater access to mmWave spectrum that will result in more advanced deployments of mobile broadband service (e.g., 5G systems) particularly in urban and suburban areas. However, further assignment of more sub-6GHz spectrum is also integral for the United States deployment of 5G technology on a truly national level. Sufficient access to low and mid band spectrum (i.e. including sub-6GHz), is critical in enabling ubiquitous access to mobile broadband services as these radio signals can expand coverage to rural and remote areas as well as improve building penetration performance.

For sub-6GHz spectrum, in 2017 the United States auctioned the 600 MHz band. Further growth in sub-6GHz spectrum will occur in the C-Band (3.7-3.98 MHz), which is scheduled for auction in late 2020. These bands are being targeted to deploy the latest 5G services. But to fully realize the benefits of 5G, additional spectrum must be available for 5G services in each of the low-band, mid-band, and high-band frequency range and the U.S. government will need to address this need.

In short, the U.S. Government's effort to speed up sub-6Ghz spectrum allocation and provide financial incentive to carriers to invest in 5G infrastructure will facilitate the domestic rollout of 5G technologies. This spectrum will need to have enough bandwidth with reasonable technical requirements to allow for an effective deployment of 5G technology. US government needs to undertake a proactive and coordinated approach to spectrum management and reallocation, involving military and industry stakeholders, to prepare for widespread 5G deployment through licensing and deconfliction of the requisite spectrum.

Question 2: *How can the U.S. Government best foster and promote the research, development, testing, and evaluation of new technologies and architectures?*

Response 2:
The U.S. government should directly support the research and development of open and interoperable interfaces in the radio access network (RAN). Developing open and interoperable interfaces is crucial for establishing and maintaining U.S. and allied leadership in 5G and future advanced wireless networks. Open architectures foster competition in the telecommunications infrastructure market and will lead to the establishment of a variety of suppliers that can supply various parts of the RAN. While many telecommunications carriers are testing and deploying open, interoperable architectures in networks today, further research and development of this critical technology will help advance these new architectures that will ensure long-term security and enhanced performance of 5G networks.

To support the advancement of 5G, the U.S. government would do well to incentivize robust research, development, and commercialization activities across universities and companies. Companies' investment level in research and development depends heavily on their return on investment. To create an incentive, government and industry need to actively promote commercial deployment and experimentation with new applications of 5G. Pre-commercial deployment in a number of cities could be one option to create innovation in 5G applications, which in return creates more 5G demand.

The U.S. government should also support foundational semiconductor research and development as part of a push to grow a strong 5G ecosystem. While the US semiconductor industry invests a significant amount of its revenue back into R&D, continued semiconductor innovation will also need government support. Continued advancements in 5G technology will be built on continued advancements in semiconductor technology. In order to foster semiconductor innovation in 5G and other critical technologies, SIA recommends:

- **U.S. federal investments in basic semiconductor research** at federal research agencies (DoD, DoE, NSF, and NIST) to enable fundamental technology breakthroughs necessary to maintain and look beyond Moore's Law and train the scientists and engineers needed to drive future innovations.
- **Grants for federal applied semiconductor R&D** through programs such as the DARPA Electronics Resurgence Initiative to enable U.S. companies to maintain their technological edge and strengthen supply chain security in semiconductor materials, process technology, architectures, designs, and applications.
- **Federal funding to help establish a public-private consortium to build and operate a National Semiconductor Technology Center** to serve as a hub for conducting advanced semiconductor research and prototyping that strengthens the domestic ecosystem. The Center would bring together industry, government, national labs, and academia around a common roadmap to drive innovations in semiconductors and develop the semiconductor workforce.

Line of Effort Two: Assess Risks to and Identify Core Security Principles of 5G Infrastructure.

Question 4: *Are there stakeholder-driven approaches that the U.S. Government should consider to promote adoption of policies, requirements, guidelines, and procurement strategies necessary to establish secure, effective, and reliable 5G infrastructure?*

Response 4:
The U.S. Government should support existing public-private partnership efforts to develop risk management tools and guidance, particularly with respect to 5G security. For example, the Department of Homeland Security's Cybersecurity and Infrastructure Security Agency (CISA), established the Information and Communications Technology (ICT) Supply Chain Risk Management Task Force in 2018 as the key convening body for supply chain risk management. The Task Force features many of the key government and industry 5G security stakeholders and this robust public-private partnership should be the primary locus of industry/government collaboration on 5G security policy issues.

Line of Effort Three: Address Risks to U.S. Economic and National Security during Development and Deployment of 5G Infrastructure Worldwide.

Question 2: *How can the U.S. Government best address the economic and national security risks presented by the use of 5G worldwide?*

Response 2:
The USG should ensure that any approach it takes is targeted at identifiable national security risks, thus avoiding overly broad policy responses that may have negative impacts on U.S. competitiveness, the United States' relationships with allies, and the U.S. governments' ability to procure 5G technology.

Given that semiconductors—which will underpin 5G technologies—are part of one of the world's most complex and interconnected supply chains, it is imperative that the U.S. government closely coordinate its technology-related national security policies with like-minded economies, such as the European Union, Japan, South Korea, Taiwan, and the United Kingdom. Multilateral export controls, for example, help keep critical technologies out of the hands of hostile actors and support U.S. economic interests by avoiding the diversion of business to other markets—unilateral actions risk undermining the efficacy and benefits of such systems. To this end, we would stress the need for the United States to work with its allies on common approaches to technology-related national security risks (such as ensuring expedited approvals of technology exports among such economies) to avoid harmful policy fragmentation and maximize the likelihood of achieving shared security objectives.

Question 3: *How should the U.S. Government best promote 5G vendor diversity and foster market competition?*

Response 3:
In order to promote vendor diversity, the government should focus efforts on promoting the greater use of open and interoperable interfaces, without mandating their use. First, as the government procures radio access network equipment, it should keep the procurement process open to equipment that uses open interfaces. With interoperable RAN systems deployed in some markets, including by Rakuten in Japan, it is clear that these systems are able to be deployed. Allowing for government procurement of interoperable systems will help grow economies of scale for this equipment and will foster competition in the market. Additionally, the government should signal that it supports the use of interoperable RAN systems. For example, the FCC is currently engaged in a proceeding to develop a framework to replace equipment in operators' networks. As the FCC develops its framework for communications equipment, they should include open RAN based solutions on the list, as well as established solutions from allied vendors. Signaling government support for open interfaces will help foster competition in the marketplace and allow for new vendors to enter the market.

Question 4: *What incentives and other policy options may best close or narrow any security gaps and ensure the economic viability of the United States domestic industrial base, including research and development in critical technologies and workforce development in 5G and beyond?*

Response 4:
As the U.S. and allies work to roll out secure 5G technologies, the semiconductor technology has a fundamental role in, and is extensively researching, how to ensure greater security in all devices. In 2017, semiconductor industry experts and leaders from SIA and the Semiconductor Research Corporation (SRC) issued a report, "Semiconductor Research Opportunities: An Industry Vision and Guide" that identifies 14 research areas for maintaining U.S. leadership in advanced computing systems.[2] One of the research thrust areas is Security and Privacy. The dependence on interconnected, intelligent systems means that security and privacy need to be intrinsic properties of the components, circuits, and systems. Design and manufacture of trustworthy and secure hardware will require design for security, security principles and metrics, security verification tools and techniques, understanding threats and vulnerabilities, and authentication strategies.

The Semiconductor Research Corporation (SRC) has convened a group of industry experts to work on a Decadal Plan outlining the key technical challenges facing the semiconductor industry over the next 10 years. The plan covers various segments of the industry relevant to 5G and future advanced wireless technologies, including:
  1. Communication
    o 6G may be the first communication milestone we will not be able to reach without additional semiconductor innovation.

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[2] https://www.semiconductors.org/wp-content/uploads/2018/06/SIA-SRC-Vision-Report-3.30.17.pdf

- o There is a growing and alarming gap between the world's technological information storage need and communication capacities. For example, while it is currently possible to transmit all of the world's stored data in less than one year, in 2040 it is predicted to require at least 20 years. The Decadal Plan is looking to stimulate collaborative research 'from materials to devices to circuits to processing and solutions' aiming at establishing revolutionary paradigms to support future high-capacity, energy-efficient communication for the vast range of future applications.
2. Security
    - o Security continues to be needed in all future semiconductor innovations.
    - o Future advances in ICT capability must go hand-in-hand with advances in security and privacy. The production and collection of data to feed AI-based engines has become today's archetypal design pattern for decision-making, analysis, actuation, prediction, and control. The scale and complexity of these data-based systems continues to grow, forcing hardware specialization and optimization to meet multiplying performance challenges. These systems have a plethora of new security and privacy challenges that warrant further research, including security in machine-learning or conventional cryptography, privacy of personal data, and risk management for hardware, data, algorithms, and training/inference engines.

Given the foundational role that semiconductors play in all aspects of 5G technology, a skilled semiconductor workforce is critical to ensuring the economic viability of the domestic industrial base and continued leadership in 5G. Leadership in semiconductor research, design, and manufacturing requires access to the best and brightest scientists and engineers from across the world. The U.S. educational system is failing to produce a sufficient number of American workers with the necessary STEM expertise to meet the needs of the semiconductor industry, as the industry develops the technologies that 5G and future advanced wireless networks will be based on. To foster the semiconductor workforce that will further develop the 5G ecosystem, SIA recommends the government:

- **Reform the high-skilled immigration system** by eliminating counterproductive caps on green cards so qualified STEM graduates from U.S. colleges and universities, as well as STEM graduates from across the world, can work, innovate, and contribute to U.S. leadership in the semiconductor industry.
- **Increase U.S. investments in STEM education** by 50 percent and implement a national STEM policy initiative to double the number of American STEM graduates. The U.S. needs a comprehensive long-term plan to attract young students - particularly underrepresented women and minorities - to science and engineering and expose them to work in labs, advanced manufacturing, and apprenticeships.

Line of Effort Four: Promote Responsible Global Development and Deployment of 5G.

Question 1: *How can the U.S. Government best lead the responsible international development and deployment of 5G technology and promote the availability of secure and reliable equipment and services in the market?*

Response 1:
As the US Government seeks to lead the responsible international development and deployment of 5G technology, it should take a few proactive measures to foster the availability of secure and reliable equipment and services worldwide:

1. **Enact the Multilateral Telecommunications Security Fund** – A bill under consideration in Congress, the USA Telecommunications Act, establishes a multilateral fund to support the development and adoption of secure and trusted telecommunications technologies. This fund could be critical in ensuring the adoption of secure and reliable equipment worldwide.
2. **Extend Development Finance Corporation (DFC) Opportunities to Upper-Middle-Income Countries** – Given the strategic and development benefits of deploying secure and trusted telecommunications infrastructure globally, DFC should be given authority to provide commercial opportunities in upper-middle-income countries for secure and trusted infrastructure projects. Under the European Energy Security and Diversification Act of 2019, DFC has been able to do so for energy infrastructure projects in Europe and Eurasia. That authority should be extended for secure and trusted telecommunications infrastructure.
3. **Export-Import (EXIM) Bank Should Adopt a More Flexible U.S. Content Rule** – Under the current EXIM policy, projects require 85% U.S. content to get full EXIM financing. This rule dates back to the 1970s and 1980s and is difficult for today's technology industry to meet. EXIM should adopt a more flexible approach to U.S. content rules that might include taking into account U.S. R&D and IP, as well as significantly lowering U.S. content requirements to support the national security priority to finance deployment of secure and trusted telecommunications infrastructure.

Question 2: *How can the U.S. Government best encourage and support U.S. private sector participation in standards development for 5G technologies?*

Response 2:
Open participation in 5G standards development bodies is critical for U.S. leadership in 5G technologies. Policymakers should ensure that the standards process remains open and free from government intervention. U.S. companies have not been able to fully participate in 5G standards bodies as a result of a lack of clarity about whether company participation is restricted by export control regulations. The U.S. government should ensure that U.S. companies can fully participate in standards bodies, without concern over participation in meetings that are also attended by companies on the Entity List. If U.S. companies cannot rely on EAR exemptions to contribute freely to standards development and related consortia, we risk permanently harming the capacity of U.S. companies to lead in creating the world's standards. The restriction can also

lead to fragmentation of standards into a "China standard" and a "rest-of-world" standard in many technological areas, to the disadvantage of U.S. companies.

Question 4: *Are there market or other incentives the U.S. Government should promote or foster to encourage international cooperation around secure and trusted 5G infrastructure deployment?*

Response 4:
As stated in response to Line Effort 1, SIA believes that an integral part of a domestic 5G commercial ecosystem is ensuring that the U.S. has a strong chip manufacturing base. To do this, the United States should look increase its competitiveness as a global investment destination. In addition to creating tax incentives for semiconductor manufacturing and a new federal grant program for states that incentives new semiconductor manufacturing facilities, the United States should continue efforts to strengthen trade and investment relationships with allies, partners, and like-minded economies around the world. Such efforts would be well-received and will complement efforts to strengthen international cooperation around secure and trusted 5G deployment.

We appreciate the opportunity to provide these comments and we look for to working with the Department of Commerce on ensuring the growth and rapid deployment of a vibrant 5G ecosystem. Please contact me at hclapsis@semiconductors.org if you have any questions.