U.S. Chamber of Commerce

1615 H Street, NW
Washington, DC 20062-2000
uschamber.com

March 25, 2022

The Honorable Gina Raimondo
Secretary of Commerce
Washington, DC 20230

Re: Incentives, Infrastructure, and Research and Development Needs to Support a Strong Domestic Semiconductor Industry; Docket Number: 220119–0024

Dear Secretary Raimondo:

The U.S. Chamber of Commerce appreciates the opportunity to submit the following comments in response to the U.S. Department of Commerce's (Department) January 24 request for information (RFI) regarding the incentives, infrastructure, and research and development needs for a strong domestic semiconductor industry. The Chamber welcomes this request as the Biden Administration continues its important work to strengthen the domestic supply chain for critical technologies.

The Chamber's membership includes the entire semiconductor ecosystem (leading edge and mature semiconductor and microelectronics manufacturers, designers, and equipment and materials makers), information and communications technology companies, and a host of semiconductor end users across the entire U.S. economy. Our comments are informed by this broad perspective and underscore the criticality of semiconductor technology.

Semiconductors are crucial to the critical technologies supply chain. They are an essential component for a vast array of products and services, ranging from automobiles, smartphones, Internet service, financial services, healthcare, and medical devices to artificial intelligence (AI), high-performance computing, 5G, and autonomous systems, semiconductors remain the foundation and future for American commercial activity, education, and defense capabilities. However, the U.S. share of global semiconductor manufacturing capacity has steadily declined from 37% in 1990 to 12% in 2020 - despite the continued growth in U.S. manufacturing capacity during the last 30 years.[1] Coordinated, targeted, and strategic efforts to reignite the U.S. semiconductor ecosystem are needed now more than ever.

Please refer to the comments below in response to the specific areas outlined in the RFI:

---

[1] Antonio Varas, Raj Varadarajan, Jimmy Goodrich, and Falan Yinug, "Government Incentives and US Competitiveness in Semiconductor Manufacturing" (Boston Consulting Group & The Semiconductor Industry Association), Page 8 https://www.semiconductors.org/wp-content/uploads/2020/09/Government-Incentives-and-US-Competitiveness-in-Semiconductor-Manufacturing-Sep-2020.pdf

I. Semiconductor Financial Assistance Program

The Chamber supported enactment of the Creating Helpful Incentives to Produce Semiconductors (CHIPS Act) for America as part of the William M. (Mac) Thornberry National Defense Authorization Act for Fiscal Year 2021 (Pub. L. 116-283) (NDAA). We urge the Administration to work with the private sector to diversify its sources of semiconductor manufacturing by increasing U.S. manufacturing capacity and supporting the U.S.'s continued global leadership in semiconductor research and development.

Semiconductor production can be viewed through three broad steps: (1) design; (2) manufacturing; and (3) assembly, test, and packaging (ATP).[2] U.S.-based companies are generally concentrated around semiconductor design with the "back-end" steps outsourced to foreign countries with lower labor costs.[3] As a result, the U.S. is home to more high-skilled and fewer labor-intensive jobs when compared to foreign countries. This is borne out by the data: over the past three decades, foreign governments have successfully drawn semiconductor fabrication expansions abroad through various incentive strategies. Today, Asia is home to 75% of global semiconductor manufacturing capacity, while the U.S. generates nearly half of global semiconductor sales due to the large number of American customers.[4]

Understanding the unique makeup of this industry, the Department cannot solely utilize traditional grant eligibility requirements, such as job creation, in awarding federal funding. The Department should award grants to recipients that will quickly advance U.S. strategic, economic, and national security goals. The Department should also consider areas such as technological performance, capital expenditure, and projects that are shovel ready in determining the recipients of grant dollars.

The funding included in this program should be aimed in part towards diversifying semiconductor supply chains away from countries of concern, such as China. The Chinese government has a long history of supporting its domestic industries through non-market practices and subsidization, and China has committed to invest heavily in building an indigenous semiconductor industry. The Department's implementation of the CHIPS Act programs will provide an essential catalyst for maintaining U.S. leadership in semiconductor design and testing.

However, that does not mean that businesses headquartered in U.S.-allied and like-minded nations around the globe should be absent from consideration. The semiconductor

---

[2] U.S. Departments of Commerce, Energy, Defense, and Health and Human Services, "Building Resilient Supply Chains, Revitalizing American Manufacturing, and Fostering Broad-Based Growth" (The White House, June 2021), Page 26, 100-day-supply-chain-review-report.pdf (whitehouse.gov)

[3] Andre Barbe, Dan Kim, David Riker, "Trade and Labor in the U.S. Semiconductor Industry" (United States International Trade Commission, July 2018), Page 3, https://www.usitc.gov/publications/332/journals/barbe_kim_and_riker_-_trade_and_labor_in_the_us_semiconductor_industry_.pdf

[4] "2021 State of the U.S. Semiconductor Industry" (The Semiconductor Industry Association, 2021), Page 15, https://www.semiconductors.org/wp-content/uploads/2021/09/2021-SIA-State-of-the-Industry-Report.pdf

industry is global in nature and reliant on open markets and supply chains that span the world. The Department should utilize existing relationships and partner with key international strategic partners and allies to bolster existing commercial partnerships abroad, attract foreign investment in the U.S., and ensure a diverse and strategic semiconductor ecosystem. All organizations, foreign or domestic, participating in this program must be subject to a transparent, thorough, and confidential review.

Further, the Administration must recognize and work with the business community to alleviate the many barriers slowing the creation of additional semiconductor fabrication plant ("fabs") capacity here in the United States. Working with Congress to fund the CHIPS Act is a good start. Building new semiconductor fabs is time and capital intensive, costing as much as $20 billion and taking upwards of three years to build a state-of-the-art facility.[5] As the commercial sector's reliance on a steady supply of semiconductors increases, the Department must identify ways to streamline the approval and distribution of federal funding. One potential avenue is through a streamlined National Environment Policy Act (NEPA) review process. As it currently stands, it takes an average of 4.5 years for a NEPA decision to be made, with certain applications taking as much as 7 years to be approved.[6] Compounding this timeline with the intensive process of building a new semiconductor facility, it could take a decade for these projects to come to fruition. While long-term investments in the semiconductor industry are needed, current needs are urgent. Considering the vital and strategic role semiconductors play in both economic and national security, the Department should work with the U.S. Environmental Protection Agency (EPA) to establish a categorical exclusion for semiconductor fabrication projects.

To address current and future semiconductor need, the Department must prioritize both leading-edge and legacy chips. Legacy items are helpful in solving immediate semiconductor demand and overall supply chain shortages. However, industry and end user research and development move at a quick pace and will rely on legacy and leading-edge chips and technology. Simply put, today's leading-edge and advanced semiconductors are tomorrow's legacy items.

To sharpen America's competitive edge in emerging technologies, such as AI, autonomous systems, and 5G, the public and private sectors will require the most advanced technology across the diverse semiconductor landscape. Yet, the stakes have never been greater for semiconductor companies working to continue driving for leading-edge innovation. According to the Boston Consulting Group (BCG), "the cost of developing the process technology for a new leading-node has gone up by an average of 40% with each node introduced in the last two decades, from approximately $100 million to $140 million for the

---

[5] Michaela D. Platzer, John F. Sargent Jr., "U.S. Semiconductor Manufacturing: Industry Trends, Global Competition, Federal Policy" (Congressional Research Service, June 27, 2016), Page 9, https://crsreports.congress.gov/product/pdf/R/R44544/3

[6] Ed Mortimer, "U.S. Chamber Coalition Moves to Defend NEPA Reforms In Court" (U.S. Chamber of Commerce, August 25, 2020), https://www.uschamber.com/infrastructure/us-chamber-coalition-moves-defend-nepa-reforms-court

180 nm node in 1999-2000 to the estimated $4 billion to $5 billion cost of the new 3 nanometer node planned for rollout starting in late 2022."[7]

To strengthen the global competitiveness in the U.S. semiconductor sector, the full chip ecosystem must be addressed. This spans the length of the production chain, from starting materials to design to packaging and final test. Semiconductor manufacturing capacity is also dependent on the production and installation of additional semiconductor manufacturing equipment, material supplies, design tools, and packaging, as well as support from the supplier base in the installation of this equipment in manufacturing facilities. All industries that depend on semiconductors have a strong interest in ensuring that semiconductor equipment makers can produce the equipment needed to increase capacity, which will help end the chip shortages. Seeking to bolster all producers within the semiconductor ecosystem in the United States will ensure a robust domestic semiconductor innovation economy and help prevent future supply chain disruptions.

Furthermore, sustainable leadership for the U.S. in semiconductor manufacturing requires not only the advanced manufacturing facilities, but also the means and access to drive continued innovation in advanced design, process equipment, as well as materials and packaging technology. These are areas where the United States brings key strengths. Maintaining this position is critical to America's interests. The Department should consider the crucial role of facilities and equipment in enabling top-of-the-line process equipment and materials systems. This is not just about enabling innovation in the most recently available technology, but also creating capabilities to drive innovation in widely used chips and other items near "legacy" status, where new materials and process technology can drive differentiated performance improvements.

II. National Semiconductor Technology Center

The National Semiconductor Technology Center (NSTC) will be a critical resource for industry, academia, and the government to collaborate in advanced development, prototyping, and packaging. Similar capabilities exist in Europe and Asia and standing up the NSTC will address a substantial supply chain vulnerability.

The Chamber supports the Department's vision of the NSTC as a hub of semiconductor-related activity, with a focus on areas and attributes that should be available to the semiconductor community. The NSTC should be organized in a manner that reflects the industry's diverse structure. Specifically, the NSTC should work closely with industry and have multiple "hubs" or "centers of excellence" that focus on different aspects of the semiconductor production process and be modeled with strong industry leadership in collaboration with government and academic partners.

Nevertheless, commercialization of semiconductor technologies is a large-scale and expensive undertaking. There must be the potential for a corresponding economic reward to

[7] Raj Varadarajan, Ramiro Palma, Antonio Varas, "Establishing Leadership in Advanced Logic Technology" (Boston Consulting Group, November 2021), Page 11, https://www.bcg.com/publications/2021/establishing-leadership-in-advanced-logic-technology

those willing to make the investments. A tight coupling between the NSTC and the private sector is critical to bridge that gap. In some cases, it may be necessary to co-locate NSTC hubs with existing infrastructure and facilities to enable a quick start and take advantage of existing resources. This includes not only the facilities and equipment themselves, but also process knowledge and personnel. This would benefit the industry broadly, including medium and small businesses, by removing certain factors limiting their participation in this market. It also will be important to ensure that the NSTC coordinate with the Department's National Advanced Packing Manufacturing Program to build on the importance of new approaches to packaging, such as heterogeneous integration.

Ideally, the NSTC should be linked into pathways of commercial manufacturing. There should be mechanisms for commercial companies to drive *both* public (pre-competitive) R&D as well as private (competitive) activities. This will ensure that the investment and platforms made available through the NSTC will be relevant as technologies move into the commercial realm.

The NSTC should adopt a model similar to the Defense Advanced Research Projects Agency (DARPA) with teams of dedicated and neutral program managers advancing and executing the NSTC's strategy while having autonomy and authority to make decisions. This would ensure fairness and encourage wide participation from all parties in the semiconductor ecosystem. The NSTC programs must be executed by a neutral entity with decisions regarding the technology agenda led by a Board composed of industry sector leadership, government, and academia. This Board would provide guidance, vision, roadmaps, and strategy and ensure alignment to future industry and governmental microelectronics needs.

However, the Department must consider the breadth of the NSTC's mission and how the federal government will meet a large volume of industry participation and partnership. There is currently little bandwidth to review and approve the contracts necessary to accomplish the NSTC's goal of being a hub of talent, knowledge, investment, equipment, and toolsets for the semiconductor industry. The Department should consider engaging in other transaction agreements (OTAs) and identify unique ways to support partnerships between the federal government, industry, and academia in a timely fashion. Other transaction authority has been successfully implemented in a number of federal agencies to date, and it enables flexibility and timeliness in decision making for both the grantor and grantee. We encourage the Department to look at these examples as it stands up the NSTC.

IV. Advanced Packaging Manufacturing Program

U.S. capabilities surrounding advanced packaging currently lag those of foreign countries, particularly in Asia. Advanced packaging represents an area of high potential for significant technological advances in the semiconductor space. The Advanced Packaging Manufacturing Program (APMP) should focus on product capability research and bolstering semiconductor supply chain resilience in support of domestic manufacturing. The APMP should establish an Advanced Packaging Manufacturing Center (APMC) to research new technologies, methods, and processes in advanced packaging. This APMC should be overseen

by a technical advisory body made up of industry leaders, researchers, academics, and U.S. Government officials.

The APMC should exist in a coordinated ecosystem with the NSTC in which both entities work to align activities in a supportive manner. These activities will support the advancement of domestic advanced packaging capabilities and further domestic semiconductor manufacturing capabilities.

V. Workforce Development Needs of the Industry

The need for a highly skilled, experienced, and talented workforce is critical for the semiconductor industry and even more critical amid recent multi-billion-dollar investments in semiconductor fabs. The U.S. alone will require 70,000 to 90,000 more workers by 2025 to address anticipated fab expansion.[8] Unfortunately, many semiconductor manufacturers are struggling to meet current needs, meaning attention and action is needed now to address these demands.

The federal government must help establish a semiconductor talent pipeline through continued focus and investment on K-12 education as well as graduate and undergraduate programs at colleges and universities. Community colleges have an important role as well, as they work closely with local communities and can tailor their curricula to meet the requirements of companies in those communities, including reskilling of current industrial employees. K-12 STEM education, apprenticeships, internships, and programs aimed at providing real-world experience in the semiconductor industry will offer future leaders in this sector the opportunity to acquire unique insight and understanding of this sector. These programs will also demonstrate its feasibility as a promising career path. The Department should also encourage partnerships between private industry and state development agencies that have existing programs and understand the availability of talent at a local level. Furthermore, these programs present a unique occasion to provide women as well as historically underrepresented and economically disadvantaged groups the opportunity to enter the semiconductor industry.

However, talent pipelines built through education and hands-on training should be considered long-term solutions. As the Department examines near-term solutions, immigration must remain part of the equation. Congress should work to expand and update the H1-B program to meet current and future need for the domestic semiconductor industry.

Conclusion:

Thank you for the opportunity to comment on this request for information. The Chamber welcomes the Biden Administration's focus and support for the domestic semiconductor industry. These products remain the foundation and future for American commercial activity, education, and defense capabilities, and it is crucial that the federal

[8] Stephanie Yang, "Chip Makers Contend for Talent as Industry Faces Labor Shortage" (Wall Street Journal, January 2, 2022) https://www.wsj.com/articles/chip-makers-contend-for-talent-as-industry-faces-labor-shortage-11641124802

government commit itself to supporting a strong semiconductor ecosystem. Through coordination with the private sector, local governments, strategic global partners and allied nations, and academia, the U.S. will be successful in diversifying its supply chain and positioning itself as the global leader in the semiconductor space.

Sincerely,

John Drake
Vice President
Supply Chain Policy
U.S. Chamber of Commerce

Jordan Crenshaw
Vice President
Chamber Technology Engagement Center
U.S. Chamber of Commerce