Comments of the
Semiconductor Industry Association (SIA)
To the National Science Foundation (NSF)
On behalf of the White House Office of Science and Technology Policy (OSTP)
On the Request for Information (RFI)
On the Development of an Artificial Intelligence (AI) Action Plan
NSF_FRDOC_0001 / 90 Fed. Reg. 9088
March 14, 2025

The Semiconductor Industry Association (SIA)[1] appreciates the opportunity to submit these comments in response to the National Science Foundation, on behalf of the White House Office of Science and Technology Policy (OSTP) on the Request for Information (RFI) on the Development of an Artificial Intelligence (AI) Action Plan.[2]

SIA applauds President Trump's vision for U.S. AI leadership – a vision which will be powered by U.S. semiconductor innovation and leadership. SIA looks forward to partnering with the administration to advance policies that ensure the United States both maintains and builds on its technology strengths.

Introduction and Background: Semiconductors Enable AI

Semiconductor technology comprises the computing backbone that powers and enables AI systems. Advanced AI applications—from natural language processing to autonomous systems—rely on high-performance chips called AI accelerators. AI accelerators include processing logic specially tuned to AI training and inferencing workloads (e.g., GPUs, CPUs, ASICs for AI, etc.), commonly consisting of advanced node transistors and high bandwidth memory (HBM) to accommodate the rapid movement of increasing data volumes, along with networking and optical connectors, among other critical components. AI accelerators are designed with features that support the calculations required by AI algorithms.[3] AI servers comprise AI accelerators alongside a host of mature-node semiconductor components – from power chips and analog to digital converters to input-output controllers. Together, the entire semiconductor supply chain enables the production of AI systems.

Building bigger "clusters"—a group of interconnected AI accelerators that can process a singular workload—has underpinned the rapid development of larger AI models. OpenAI used around 10,000 AI accelerators to train the version of ChatGPT that it launched in late 2022.[4] The largest AI clusters now under construction will use upwards of 100,000 AI accelerators or more, an advancement driven by new networking and memory technologies. These large clusters are unprecedented not only in their ability to execute large computing workloads, but also in the costs required to operate the data centers clusters due to high energy demands. Advancements

[1] The Semiconductor Industry Association (SIA) is the voice of the semiconductor industry, one of America's top export industries and a key driver of the country'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 over a quarter of a million workers in the United States. U.S. semiconductor sales totaled $264 billion in 2023. SIA members account for 99% of all U.S. semiconductor industry sales. Through this coalition, 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. Learn more at www.semiconductors.org.
[2] 90 Fed. Reg. 9088, February 6, 2025.
[3] Saif M. Khan, Center for Security and Emerging Technology, "AI Chips: What They Are and Why They Matter," April 2020. https://cset.georgetown.edu/publication/ai-chips-what-they-are-and-why-they-matter/.
[4] Asa Fitch, *The Wall Street Journal*, "AI's Future and Nvidia's Fortunes Ride on the Race to Pack More Chips Into One Place," November 23, 2024. https://www.wsj.com/tech/ai/nvidia-chips-ai-race-96d21d09.

in more efficient chips through innovation in chip design and manufacturing processes and effective use of infrastructure software help to manage these costs. Together they confer economic advantage to American data centers, American chip firms, and American companies leveraging AI tools.

Companies from sectors across the economy are increasingly leveraging centralized and edge AI to drive their product innovations, powered by cutting edge chip technologies. Sectors like healthcare, agriculture, defense, communications, manufacturing, transportation, and more increasingly rely on AI-enabled applications that in turn depend on semiconductor-based sensors, processors, and connectivity solutions to gather data, run AI algorithms, and deliver real-time insights.

Even within the semiconductor sector, chip designers and manufacturers are adopting AI into their own operations to maximize efficiency and drive innovation – a virtuous cycle. For example, chip companies use AI tools to align timing and deployment of manufacturing tools in the more than 1,000 steps of chip fabrication, or use machine learning to design, verify, and test semiconductor devices to enhance performance or migrate to a new technology node. These innovations have improved worker safety and productivity, reduced fail rates and resolved quality control issues, and help to bring new chip products and manufacturing processes to market more efficiently.

Maintaining American leadership in AI will require a robust and diverse semiconductor ecosystem that supports cutting-edge chip research, design, and manufacturing – to include production equipment and materials – and government policies that facilitate continued growth of this ecosystem. Sustained investments in semiconductor R&D and supply chain resilience are necessary to ensure AI innovators in the U.S. maintain continued access to the most advanced chips, giving companies and the United States a competitive edge in the global AI sector. As AI continues to transform economic sectors, strengthening semiconductor capabilities is critical to unlocking the full potential of AI technologies and extending America's global technology leadership.

SIA Recommendations for AI Action Plan

America's AI Action Plan should include strategies to ensure the U.S. leads the world in designing and manufacturing the semiconductor technologies that fuel AI. To advance U.S. semiconductor leadership, the AI Action Plan should provide for coordinated and complementary efforts to promote industry innovation and industry competitiveness globally while protecting economic and national security. We encourage the U.S. government to leverage a varied and robust toolbox to incentivize American chip research, design, and manufacturing, such as through extended and expanded investment tax credits,[5] as well as by advancing trade and other economic policies that will create new demand for American chip technologies both domestically and globally.

We also encourage the U.S. government to closely collaborate with partner and allied nations to facilitate R&D and workforce exchanges as well as access to essential technologies and manufacturing inputs.

[5] IRC Section 48D, the Advanced Manufacturing Investment Credit (AMIC), is set to expire in 2026. This credit should be extended to provide a durable incentive to manufacturing chips in America, as well as expanded to include chip R&D and design to ensure that the next generation of technology is innovated and commercialized in the United States.

SIA and our member companies understand and agree that export controls are important and necessary tools for safeguarding national security. At the same time, American national security and sustained AI and chip leadership also rest on the continued competitiveness and adoption of the U.S. technology stack globally. Measures that limit the diffusion of American semiconductor and AI technologies should be carefully crafted with transparent licensing processes – in consultation with the industry leaders who know the technologies and market realities best – to ensure they are as minimally disruptive as possible and do not inadvertently accelerate the development of alternatives to these U.S. technologies, or signal to global customers that U.S. companies are no longer reliable, long-term partners.

We note, however, that semiconductor hardware has become the primary – if not singular – target of recent export control efforts aimed at restricting AI, as well as proposals and recommendations by other industry players[6] and the think tank community.[7] However, we note that there are other means through which entities can leverage AI compute power without having physical access to controlled semiconductor hardware, and which fall outside semiconductor companies' ability to control.

Appendix A, SIA's policy agenda, *"Winning the Chip Race: American Semiconductor Innovation & Competitiveness under the Trump Administration & the 119th Congress,"*[8] sets forth policy recommendations on: Semiconductor Manufacturing Incentives and R&D Investments; Tax; Research; Workforce and Immigration; Economic Security – Trade & Supply Chain Resilience; National Security – Export Controls & Technology Restrictions; and Environmental & Energy Regulation.

Appendix B provides additional recommendations on topics outside of those mentioned in Appendix A.

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SIA appreciates the opportunity to comment on this RFI, and we look forward to continuing to work with the Trump administration on the development and implementation of the AI Action Plan.

[6] Anthropic, "Anthropic Response to OSTP RFI," March 6, 2025. https://assets.anthropic.com/m/4e20a4ab6512e217/original/Anthropic-Response-to-OSTP-RFI-March-2025-Final-Submission-v3.pdf.
[7] Special Competitive Studies Project, "Securing America's Technological Advantage in Next-Generation Microelectronics," March 5, 2025. https://www.scsp.ai/wp-content/uploads/2025/03/Semiconductors-Memo.pdf.
[8] SIA, "Winning the Chip Race," January 2025. https://www.semiconductors.org/winning-the-chip-race/.

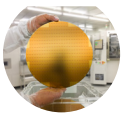
APPENDIX A - WINNING THE CHIP RACE:

American Semiconductor Innovation and Competitiveness under the Trump Administration & the 119th Congress

SIA POLICY RECOMMENDATIONS

The strategy for advancing U.S. semiconductor leadership must consist of coordinated, complementary efforts to promote industry innovation and competitiveness while protecting economic and national security.

SIA stands ready to work with policymakers to adopt and implement a robust policy agenda to advance U.S. semiconductor leadership.



SEMICONDUCTOR MANUFACTURING INCENTIVES & R&D INVESTMENTS

Advance incentives for U.S. chipmaking and investments in American innovation

TAX

Ensure the U.S. remains a competitive tax destination to invest in semiconductor research, design, and manufacturing

RESEARCH

Support existing R&D initiatives and grow federal investment in semiconductor research and basic research across the physical sciences to enable U.S. technology leadership and win technologies of the future

WORKFORCE & IMMIGRATION

Grow the talent pipeline by developing, attracting, and retaining a high-skilled workforce

ECONOMIC SECURITY - TRADE & SUPPLY CHAIN RESILIENCE

Restore U.S. trade leadership, build strong and complementary global chip supply chains, and facilitate access to new and growing markets

NATIONAL SECURITY – EXPORT CONTROLS & TECHNOLOGY RESTRICTIONS

Ensure policies are carefully calibrated and targeted, effective, and do not undermine the interests they are designed to protect

CHINA

Out-compete, out-innovate, and out-flank to win the future for U.S. semiconductors

ENVIRONMENTAL & ENERGY REGULATION

Streamline regulatory and permitting requirements to promote innovation and industry growth, protect workers and the environment, and support American energy strength domestically and around the world

About SIA: The Semiconductor Industry Association (SIA) is the voice of the semiconductor industry, one of America's top export industries and a key driver of the country'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 over a quarter of a million workers in the United States. U.S. semiconductor sales totaled $264 billion in 2023. SIA members account for 99% of all U.S. semiconductor industry sales. Through this coalition, 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. Learn more at www.semiconductors.org.

SEMICONDUCTOR MANUFACTURING INCENTIVES AND R&D INVESTMENTS

Advance incentives for U.S. chipmaking and investments in American innovation

Importance

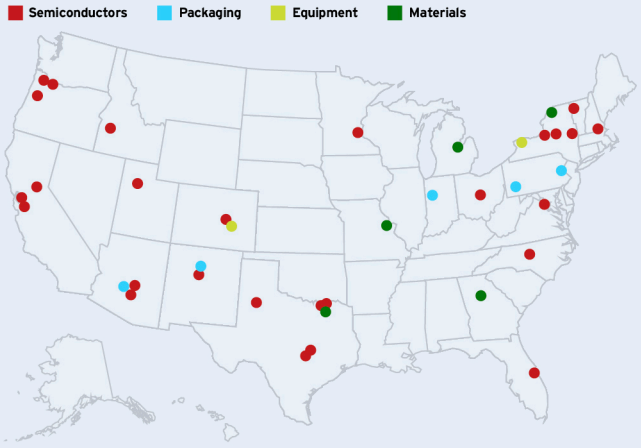
Originally conceived and authorized during the first Trump Administration to address critical national security risks and supply chain vulnerabilities facing the U.S., the CHIPS Act continues to address pressing economic and national security priorities. The law rests on two pillars: 1) incentives for manufacturing in the form of a 25% investment tax credit and $39 billion in grants; and 2) investments in chip innovation through $13 billion for research programs and infrastructure.

These incentives and investments promise powerful results for America:

- **Manufacturing incentives have sparked $540 billion in announced private sector investments** to revitalize the U.S. chip ecosystem, setting in motion a **tripling of U.S. chipmaking capacity** while creating over 68,000 manufacturing jobs and 122,000 construction jobs, which will support hundreds of thousands of additional jobs throughout the economy.
- **R&D investments are building the framework** to maintain and extend U.S. technology leadership, strengthening links between researchers and manufacturers to accelerate the transition of new innovations into commercial or defense products with benefits that will multiply throughout the economy and enhance our national security.
- Workforce development initiatives in partnerships between companies, community colleges, and universities are training **future semiconductor technicians, chip designers, and engineers.**

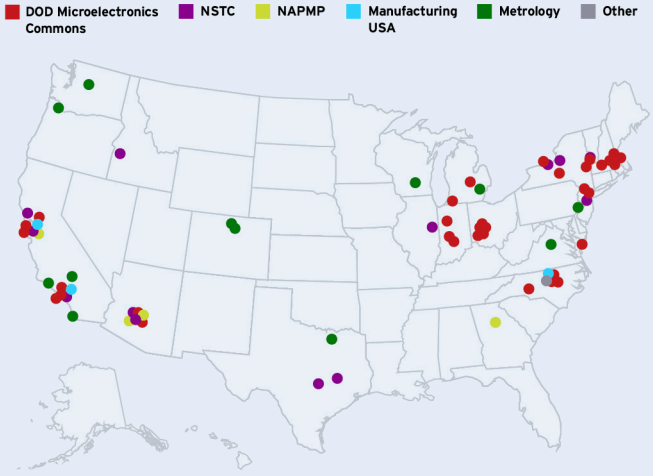
CHIPS awards announcements

Preliminary memoranda of terms (PMTs) and final agreements announced by the CHIPS Program Office



Source: SIA, CHIPS Program Office

CHIPS R&D programs awards



Source: SIA, Department of Commerce, Department of Defense

Challenges

While substantial progress has been made in implementing semiconductor manufacturing incentives and research investments since initial authorization of the CHIPS Act, substantial work remains to realize the important economic and national security objectives of the law. In the meantime, global competitors continue to invest in their semiconductor ecosystems and advance their technological capabilities.

Recommendations

- **Ensure continuity and effective implementation of the grant program**, including the efficient disbursement of funds consistent with final awards and expediting negotiations with companies who have reached preliminary agreements but lack a final contract.
- **Expedite award agreements and improve efficiency** by streamlining and limiting requirements unrelated to U.S. economic and national security.
- **Continue rollout of the R&D programs** and ensure these initiatives drive the next generation of technology consistent with industry priorities.

TAX

Ensure the U.S. remains a competitive tax destination to invest in semiconductor research, design, and manufacturing

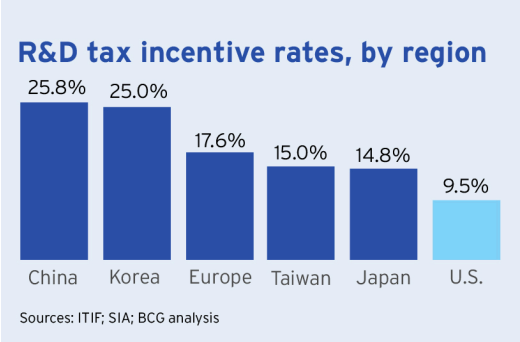
Importance

Chip leadership is critical to ensuring U.S. economic and national security, and it produces a multiplier effect in driving innovation and growth throughout the economy, including technologies of the future such as AI. A globally competitive tax code is key to ensuring the U.S. remains the leader of the chip industry and remains an attractive destination for companies to invest and innovate. For the U.S. semiconductor industry, this requires targeted tax policies to spur investment in the core activities of chip research, design, and manufacturing.

Driving technological change in the industry requires companies to develop more complex designs and process technologies, as well as introduce advanced production machinery capable of manufacturing cutting-edge chips. The ability to innovate and produce state-of-the-art semiconductors requires U.S. chip companies to invest billions of dollars in R&D annually – on average 20% of revenue – to maintain technology and market leadership, with an additional 20% of revenue on average re-invested in capital expenditures.[1]

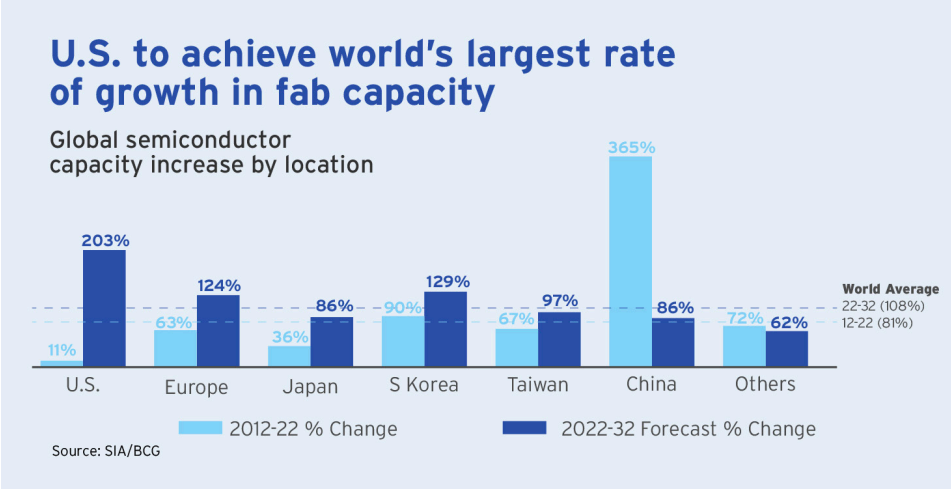
Challenges

1. **Chip Design and Other Critical Research & Development.** The U.S. continues to trail the incentives offered by global competitors for innovation in chip design and R&D investments. And the U.S. is falling even further behind due to the requirement to amortize domestic research expenditures over 5 years, rather than deducting these expenditures immediately as is the case in almost all other advanced economies. Despite the essential nature of chip design, only 27% of global semiconductor design activity is conducted in the United States.[2] Meanwhile, global competitors increasingly offer strong incentives for companies to make R&D and chip investments on their shores, including China's 220% "super deduction" for semiconductor R&D.[3] **In fact, the U.S. is the only major semiconductor region without a targeted, enhanced tax incentive for semiconductor design or R&D, placing us last among major semiconductor regions in overall R&D tax incentives.**



While competitors overseas continue to incentivize domestic chip research and design, innovation costs are rising with each new generation of technology. Foreign competition, particularly from Chinese design firms seeking to displace U.S companies, underscores the importance of ensuring the U.S. remains a competitive destination for companies to invest in chip design and R&D.

2. **Manufacturing.** Governments around the world have heavily invested in the development of their own semiconductor manufacturing industries, resulting in an unlevel playing field for investment in the U.S. Before the U.S. took steps to incentivize domestic chip manufacturing, heavy overseas subsidies created a significant cost disparity in which it cost 25-50% more to build and operate a fab in U.S. than abroad.[4] As a result, the U.S. share of global fabrication capacity declined from 37% in 1990 to 10% in 2022.[5] Incentives, such as the advanced manufacturing investment credit **(IRC §48D)** have helped start to reverse the decades-long decline in U.S. semiconductor manufacturing capacity, with the U.S. projected to triple its manufacturing capacity between 2022 and 2032. However, this credit is set to expire in 2026, thereby **threatening the ability to make sustained, long-term investments in America's chipmaking capacity.**



[1] SIA, "2024 Factbook," May 2024. https://www.semiconductors.org/wp-content/uploads/2024/05/SIA-2024-Factbook.pdf

[2] BIS, "Assessment of the Status of the Microelectronics Industrial Base in the United States," December 2023. https://www.bis.doc.gov/index.php/documents/technology-evaluation/3402-section-9904-report-final-20231221/file

[3] PWC, "People's Republic of China, Corporate – Deductions," June 2024. https://taxsummaries.pwc.com/peoples-republic-of-china/corporate/deductions

3. **Onshore Intellectual Property (IP).** Encouraged by the deduction for Foreign-Derived Intangible Income (FDII), which was established by the Tax Cuts and Jobs Act (TCJA) of 2017, many companies repatriated significant IP from abroad. The FDII provision significantly expanded the U.S. tax base, contributing to the rise in corporate taxes post-TCJA, and encourages companies to develop and maintain their valuable IP in the U.S. The current rate for this important provision is set to expire at the end of 2025.

Recommendations

Adopt policies to make the U.S. a competitive destination for semiconductor companies to invest and innovate:

1. The highly impactful **advanced manufacturing investment credit** (IRC §48D) should be **extended** beyond 2026 to incentivize the continued buildout of long-term domestic manufacturing capacity[6] and **expanded** to include chip design and other R&D by passing the Semiconductor Technology Advancement and Research (STAR) Act.[7] Passing this legislation would help to level the playing field between the U.S. and global competitors and ensure the U.S. continues to grow its manufacturing capacity and retains its first-mover advantage in chip design and R&D. In addition, the definition of "semiconductor" should be modified to encompass all stages of semiconductor production, such as the production of semiconductor-grade polysilicon.

2. **Restore the full and immediate expensing of all R&D expenditures under IRC Section 174** on a permanent basis to support sustained innovation.

3. **Maintain the current Foreign-Derived Intangible Income deduction** to protect the U.S. tax base and encourage companies to develop and mature their intellectual property in the U.S. rather than abroad.

[4] SIA/BCG, "Government Incentives and U.S. Competitiveness in Semiconductor Manufacturing," September 2020. https://www.semiconductors.org/wp-content/uploads/2020/09/Government-Incentives-and-US-Competitiveness-in-Semiconductor-Manufacturing-Sep-2020.pdf

[5] SIA/BCG, "Emerging Resilience in the Semiconductor Supply Chain," May 2024. https://www.semiconductors.org/emerging-resilience-in-the-semiconductor-supply-chain/

[6] The credit has proven to drive private investment and provide significant economic, national security, and supply chain benefits, and the Joint Committee on Taxation estimates the cost of a 10-year extension to be only $8.445 billion.
Congressional Budget Office, "Budgetary Outcomes Under Alternative Assumptions About Spending and Revenues," May 2024, citing Joint Committee on Taxation estimates. https://www.cbo.gov/system/files/2024-05/60114-Budgetary-Outcomes.pdf.

[7] H.R. 9183 in the 118th Congress. https://www.congress.gov/bill/118th-congress/house-bill/9183

RESEARCH & DEVELOPMENT:

Support existing R&D initiatives and grow federal investment in semiconductor research and basic research across the physical sciences to enable U.S. technology leadership and win technologies of the future

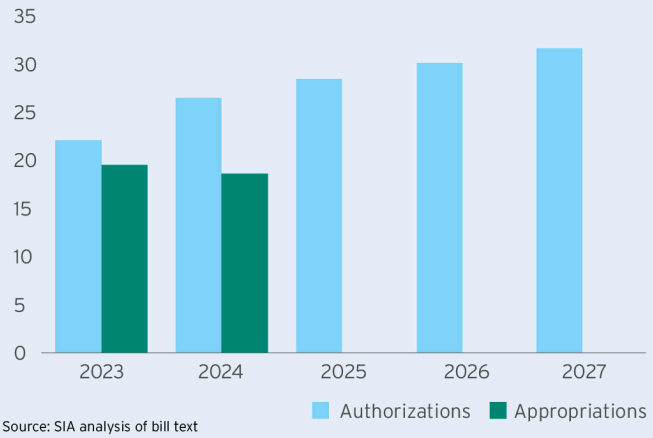
Importance

Given the critical enabling role of semiconductors in advancing innovations in technologies of the future — such as AI, quantum computing, energy, and 5G/6G — continued U.S. investment in semiconductor R&D is essential for the U.S. to lead the world in these technologies. Federally funded basic and applied research conducted at national labs and universities drives the next generation of technology, fueling economic growth and national security. Existing and new research programs established under the CHIPS and Science Act are supporting a new framework and infrastructure for continued U.S. leadership in semiconductor technology by bridging the gap from "lab to fab," driving innovation in advanced packaging, and jumpstarting initiatives in metrology and digital twins.[1]

These investments and other federal investments in semiconductor R&D provide an outsized return on investment through huge benefits across the entire economy: we estimate that every $1 invested by the federal government into semiconductor research has increased overall U.S. gross domestic product (GDP) by $16.50.[2]

CHIPS & science authorizations vs. appropriations

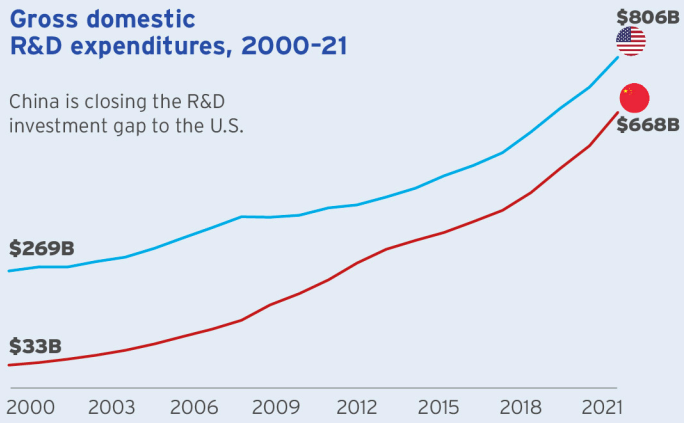
NSF, NIST, DOE-Science total funding ($ in billions)



Source: SIA analysis of bill text

Gross domestic R&D expenditures, 2000-21

China is closing the R&D investment gap to the U.S.



Current PPP dollars
Source: National Science Board Indicators, OECD, MSTI

Challenges

While the CHIPS and Science Act made historic investments in semiconductor research, these investments need to be sustained. In addition, federal investments in basic research across the physical sciences have failed to keep pace with the rising costs of developing new technology. Meanwhile, global competitors are investing heavily to challenge U.S. scientific leadership. Congress authorized significant investments in the federal R&D enterprise at the National Science Foundation, the National Institute for Standards and Technology, and the Department of Energy Office of Science, but appropriations for these agencies have remained fixed near FY23 levels and are more than $10 billion behind the levels authorized.

Recommendations

- **Fund federal research at authorized levels** to ensure the U.S. remains the global leader in innovation, enabling researchers to make discoveries today that will transform semiconductor technology in the next decade while building the pipeline of scientists and engineers needed to maintain technology leadership.
- **Ensure continued progress in the execution of the CHIPS R&D programs**, expediting implementation where possible, establishing affiliated technical centers of the National Semiconductor Technology Center (NSTC)[3] to focus on R&D in specific technology domains (e.g., memory or analog-mixed signal), and prioritizing support for industry research roadmaps, as well as to promote transfer to the defense industrial base.
- **Promote the long-term success of semiconductor R&D programs** by authorizing future funding beyond 2026, collaborating on research with allies and partners, and scaling federal R&D and public-private partnerships dedicated to AI and quantum computing.

[1] Research programs under the CHIPS Act include the National Semiconductor Technology Center (NSTC), the National Advanced Packaging Manufacturing Program (NAPMP), the CHIPS Metrology Program, the SMART USA Manufacturing USA Institute, and the Department of Defense Microelectronics Commons.

[2] SIA, "Sparking Innovation: How Federal Investment in Semiconductor R&D Spurs U.S. Economic Growth and Job Creation," June 2020. https://www.semiconductors.org/sparking-innovation/

[3] The NSTC, which is a public-private partnership operated by the National Center for the Advancement of Semiconductor Technology, intends to extend U.S. leadership in semiconductor technology, reduce the time and cost to prototype ideas, and advance semiconductor workforce development.

WORKFORCE & IMMIGRATION:

Grow the talent pipeline by developing, attracting, and retaining a high-skilled workforce

Importance

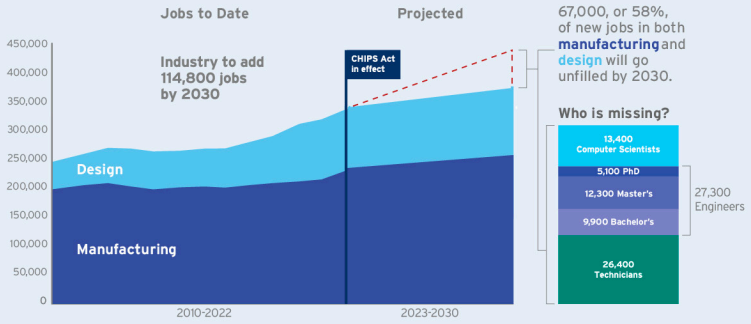
To drive semiconductor innovation and U.S. economic competitiveness, America needs to adopt and update policies to educate, attract, and retain the top engineering, scientific, and technical talent in the world and train a skilled workforce for the U.S. semiconductor industry and other strategic technology sectors. From manufacturing technicians with a short-term certificate to chip design engineers with advanced degrees, a growing semiconductor talent pipeline provides career opportunities for all Americans.

Challenges

The competitive position of the U.S. semiconductor industry, as well as other critical and emerging technology industries of strategic importance, depends on an American workforce that is the best educated and trained in the world. Unfortunately, the industry's need for a skilled workforce greatly exceeds the available talent developed through our U.S. education system and existing training programs. At current rates, the U.S. will not keep up with demand for skilled workers in the semiconductor industry — including for the construction of new fabs — and among all critical technology sectors.[1]

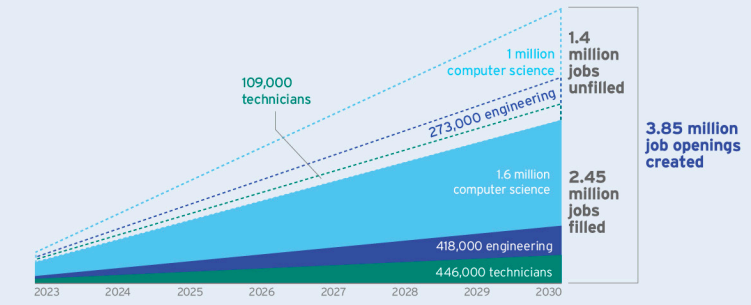
Addressing this shortfall requires a comprehensive approach. More must be done to encourage U.S. students to: 1) pursue education and training in critical areas for the industry; 2) engage in semiconductor-related research and pursue advanced degrees in larger numbers; and 3) choose the semiconductor industry over other competing technology fields. The U.S must also improve access to international students at U.S. universities, where foreign nationals currently comprise approximately 60% of advanced degree STEM graduates in key areas for the industry. Unfortunately, current U.S. immigration policies create obstacles for these highly educated foreign students to stay in this country over the long term, where they could contribute to economic growth and discoveries that support U.S. competitiveness and technology leadership.

Historical semiconductor workforce and projected 2023-2030 gap



Source: SIA/Oxford Economics

Projected U.S. demand for computer sciences, engineers, and technicians, 2023-2030



Source: SIA/Oxford Economics

Recommendations

- Increase and sustain funding for federal R&D programs at NSF, NIST, DOE, and DOD to train and build the pipeline of scientists and engineers needed to drive innovation in the semiconductor industry and other strategic technologies. Programs should be targeted at encouraging U.S. students to pursue advanced degrees and engage in research in areas of critical need.
- Expand skills training initiatives, including increased funding for apprenticeship programs and university chip design programs, reauthorization of the Workforce Innovation and Opportunity Act (WIOA) and Perkins Career and Technical Education Act (CTE), and continuation of workforce development efforts within the CHIPS R&D program and Department of Labor.
- Support opportunities for underrepresented sources of talent, including veterans and military spouses, workers seeking new career paths, rural students, traditionally underrepresented students, and other economically disadvantaged individuals.
- Improve affordability, such as by increasing the availability of federal funding for scholarships, fellowships, and other programs that encourage enrollment in critical areas of study, as well as expanding Pell grants to include short-term training.
- Advance targeted immigration policies that reduce the employment-based green card backlog and improve the industry's ability to attract and retain foreign national workers with critical skills, particularly at the advanced degree level.

[1] SIA/Oxford Economics, "Chipping Away: Assessing and Addressing the Labor Market Gap Facing the U.S. Semiconductor Industry," July 2023. https://www.semiconductors.org/chipping-away-assessing-and-addressing-the-labor-market-gap-facing-the-u-s-semiconductor-industry/

ECONOMIC SECURITY: TRADE & SUPPLY CHAIN RESILIENCE

Restore U.S. trade leadership, build strong and complementary global chip supply chains, and facilitate access to new and growing markets

Importance

Supply-side investments in the United States are helping to reverse a decades-long downward trajectory in the share of semiconductor manufacturing capacity in the U.S. To justify long-term, capital-intensive investments in U.S. semiconductor production, chipmakers need confidence that their products will have access to global markets. Roughly 75% of U.S. semiconductor industry revenue comes from overseas sales, which are essential to ensuring the U.S.-based semiconductor industry remains the global leader, as well as a core driver of innovation and growth for the U.S. economy. But while the U.S. sits on the sidelines, competitor nations have continued to negotiate preferential trade deals and forge supply chain networks that put U.S. industry at a competitive disadvantage.

Challenges

To complement efforts to run faster here at home and ensure our companies remain globally competitive, the U.S. must pursue a proactive, market-opening trade and investment agenda that creates new demand for Made-in-America chips overseas and facilitates U.S. semiconductor sales in new and emerging markets. The U.S. government must also stand up for American companies when they face unfair treatment in overseas markets. Semiconductors have long been a top U.S. export. American semiconductor exports, however, fell by nearly 16% from 2022 to 2023. And despite U.S.-government led efforts to strengthen economic ties in the Indo-Pacific, Asia's (excluding China) share of overall U.S. semiconductor revenue is actually declining, dropping from 35% in 2021 to 32% in 2023. By contrast, China has active free trade agreements with 26 countries and territories and is negotiating an additional eight agreements aimed at bolstering its domestic industry and capturing a greater share of global semiconductor demand.

Recommendations

- **Promote investment in U.S.-based chip research, design, and manufacturing:** Healthy trade and supply chain resilience require a foundation of sustained domestic investments in semiconductor innovation and competitiveness.
- **Pursue smart trade and supply chain deals that create demand for Made-in-America chips and downstream products:** Negotiate reciprocal trade and other economic deals with partners and allies that facilitate increased sales of U.S. semiconductors globally, create preferential markets for our chips and downstream electronics products, encourage investments by international semiconductor firms here in America, and incentivize the creation of trusted supply chains. Build on existing bilateral and plurilateral trade platforms with a view to strengthen trusted semiconductor supply chains and reduce America's and its allies' dependence on less reliable trade partners.
- **Stand up for U.S. companies and restore reciprocity:** Leverage a comprehensive and varied toolbox to aggressively combat discriminatory barriers and non-market policies and practices in other countries that unfairly tilt the playing field, undercut U.S. competitiveness, and create strategic dependencies and overconcentration. Work with trusted partners and allies to impose coordinated, multi-country responses that maximize impact and minimize potential free-riding and backfilling.
- **Build resilient and diverse semiconductor supply chains:** Work with supply chain partners and likeminded governments to build global supply chain capabilities that complement and support semiconductor industry operations in the U.S., including diverse and secure sourcing alternatives both for upstream semiconductor materials, like critical minerals and specialized chemicals, and for downstream markets, like automotive, industrial, and electronics. Ensure U.S.-headquartered companies enjoy nondiscriminatory access to semiconductor incentive programs offered by governments in foreign markets and align U.S. incentive programs to attract investment from allies and partners.
- **Advance policies that help chip companies operate more efficiently:** Promote trade facilitation policies globally that enable the smooth functioning of semiconductor supply chains, such as dismantling customs barriers, improving transparency, expediting customs clearance procedures, and ensuring the free movement of semiconductor data across borders.

NATIONAL SECURITY: EXPORT CONTROLS & TECH RESTRICTIONS

Ensure policies are carefully calibrated and targeted, effective, and do not undermine the interests they are designed to protect

Importance

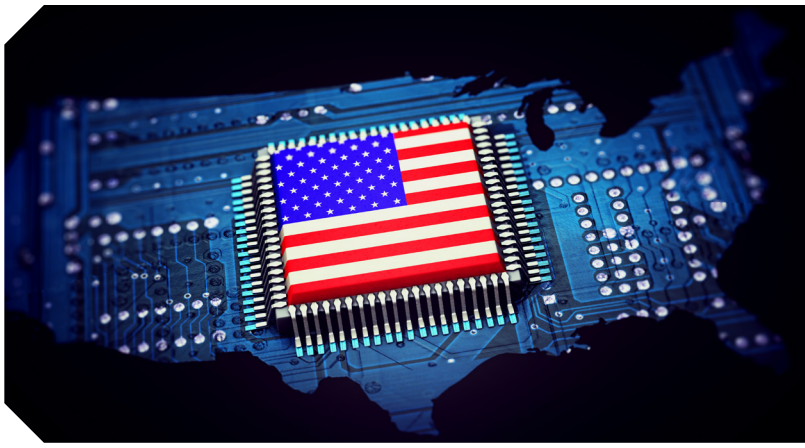
Continued U.S. leadership in semiconductor technology and innovation across the supply chain — logic, memory, analog, advanced packaging, equipment, and materials — is critical to America's national security and economic strength. American military systems are the most advanced and capable in the world. This would not be possible without American semiconductor technology. Chips underpin critical infrastructure systems, the U.S. industrial base, and "must-win" technologies of the future, including AI, 5G, and quantum computing.

But the fact remains, the health and vitality of the U.S. semiconductor industry is dependent on our companies' ability to fulfill overseas demand. Roughly 75% of U.S. chip industry revenue comes from sales to overseas customers. Export controls, outbound investment restrictions, and other policies are necessary tools for safeguarding national security. However, poorly calibrated and excessive regulations, developed without sufficient industry expertise, risk ceding strategic markets and weakening American semiconductor competitiveness globally.

Challenges

The U.S. semiconductor industry understands the need for targeted policies designed to achieve specific national security objectives. But this must be done without unduly harming commercial innovation, manufacturing, employment, and continued American leadership in critical technologies. The U.S. government has issued multiple, consequential – and often unilateral – semiconductor-focused restrictions intended to protect U.S. national security and economic security under a "small yard, high fence" doctrine. In the past few years, however, the "small yard" of strategic technologies has grown substantially bigger. These regulations are reshaping semiconductor supply chains and the global competitive landscape for chips and downstream chips-consuming firms alike, causing too many customers around the globe to shift reliance to non-U.S. chips suppliers, and prompting retaliatory actions designed to degrade U.S. semiconductor competitiveness. These policies require review and re-evaluation to assess whether they are achieving their intended objectives or whether they are hindering the U.S. technology base and our technology leadership.

Recommendations



- **Pursue coordinated, targeted actions with key supplier nations:** Export controls and other technology restrictions should be narrowly targeted to meet specific national security objectives and pursued in alignment with other key supplier nations. The joint pursuit of such technology restrictions not only ensures that the national security objectives of those actions are actually met, but also that the U.S. semiconductor industry can compete on a level playing field around the world. It is equally important to pursue policies that increase the market base and boost demand for U.S. chips both domestically and in foreign markets.
- **Evaluate impact:** The government should undertake a comprehensive evaluation of past semiconductor-focused technology restrictions to determine whether they have achieved their specific national security and foreign policy objectives, understand the collateral impact on the U.S. national security innovation base — including the degree to which U.S. semiconductor technologies are "designed out" globally and replaced by foreign alternatives — and assess whether other policy tools may be more effective.
- **Reduce regulatory burdens:** Reform regulations and processes to ease restrictions on export-controlled trade to trusted partners and allies to foster cooperative technological innovation, support security/defense partnerships, facilitate investments in each other's markets, and expand the market base for Made-in-America chips. Avoid creating incentives for the development of new technologies outside the U.S., including by modernizing outdated controls. The Commerce Department should, where possible, allow for delayed implementation of regulations to give the private sector time to adjust and build the necessary compliance capabilities.
- **Consult industry:** Government should work closely with industry to ensure controls are crafted in a manner that enhances our national security while still enabling the U.S. semiconductor industry to compete, grow, and innovate. The Commerce Department should establish the long-delayed President's Export Council Subcommittee on Export Administration (PECSEA), update membership on technical advisory committees, and put in place other channels for regular engagement with industry leaders.

CHINA

Out-compete, out-innovate, and out-flank to win the future for U.S. semiconductors

Importance

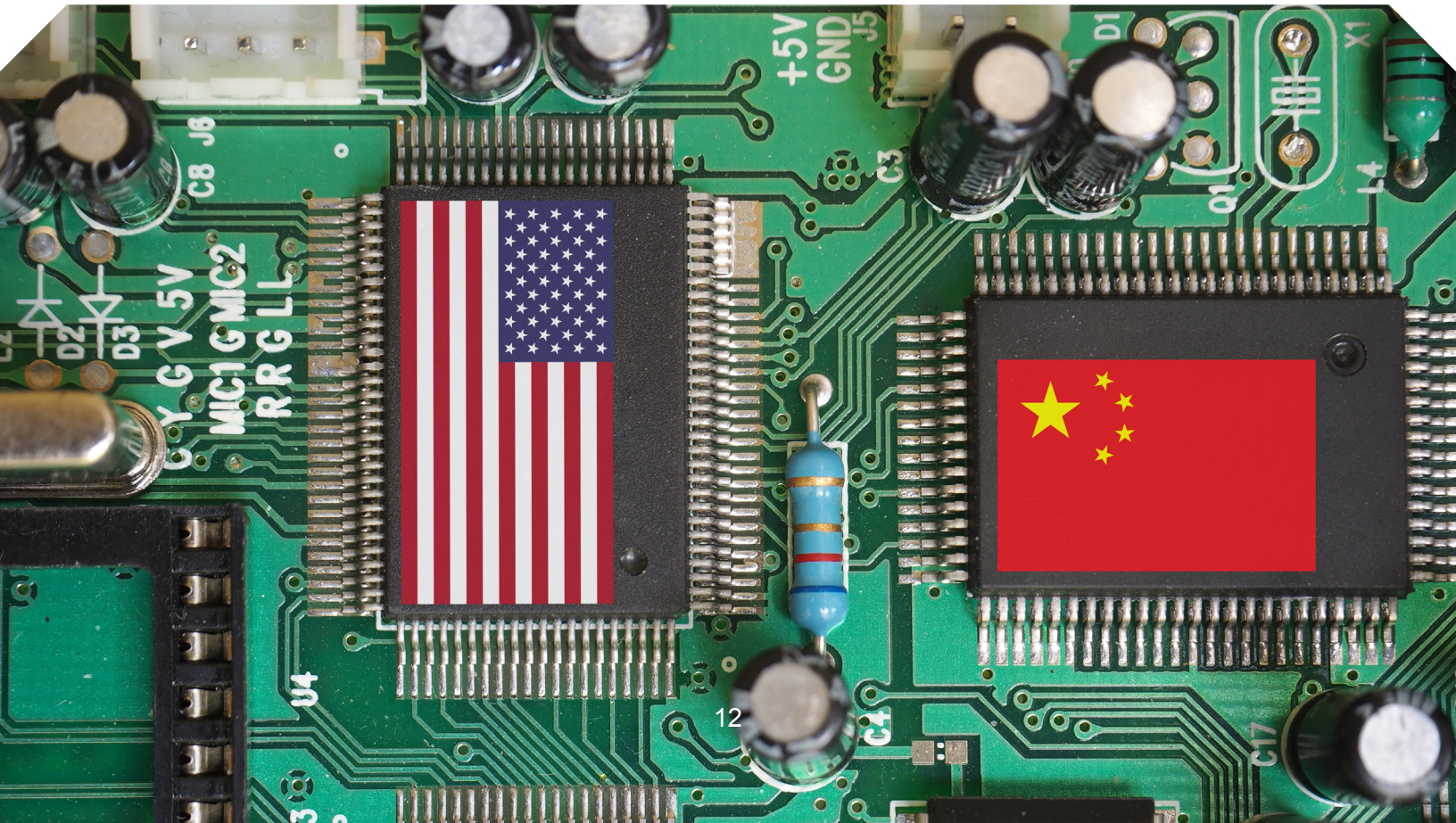
China is a major player in the global semiconductor industry, both as the world's largest market for semiconductors and as a serious and growing producer and competitor. As the world's largest electronics manufacturing hub, China consumed 31% of U.S. chip sales in 2023. As a producer, China commands roughly 20% of front-end and nearly 40% of back-end semiconductor manufacturing capacity. For mature-node semiconductors (≥28nm), roughly 37% of wafer-manufacturing capacity is projected to be concentrated in China by 2027. In May 2024, China launched Phase 3 of its National Integrated Circuit Fund, funneling $47.5 billion in government subsidies to China's domestic semiconductor ecosystem in an effort to achieve self-sufficiency.

Challenges

As outlined in its 14th Five-Year Plan and its "Made in China 2025" strategy, Beijing is working to develop an "independent and controllable" semiconductor industry in China through both supply-side and demand-side measures. China pursues a wide array of industrial policies and non-market practices designed to displace U.S. and foreign-made chips in its domestic market, and ultimately globally. The U.S. must meet the so-called "China Challenge" with strength – by pursuing smart "promote" policies with partners and allied countries that help us pedal faster on the global stage.

Recommendations

- **Build and expand America's Semiconductor Strength:** Double down on investments in U.S. semiconductor R&D, advanced manufacturing, and workforce development to strengthen our domestic base and ensure American companies remain at the forefront of innovation and market position. Invest in supply chain capabilities in the U.S. and in partner countries that support and complement U.S. semiconductor industry operations, including for upstream materials production and back-end assembly, test, and packaging.
- **Counter Unfair, Non-Market Practices:** Utilize a varied toolbox to counter practices that distort markets, drive strategic overdependencies, undermine fair competition, and discriminate against U.S. semiconductor companies and their products, based on the principle of reciprocity.
- **Lead Allies and Partners in Common Cause:** Work closely with partners to advance shared objectives and strategic interests, and counter unfair, non-market, and coercive practices through coordinated, joint policy actions.



ENVIRONMENTAL & ENERGY REGULATION

Streamline regulatory and permitting requirements to promote innovation and industry growth, protect workers and the environment, and support American energy strength domestically and around the world

Importance

Semiconductor fabrication operations and continued innovation require dependable on access to key inputs such as specialized chemicals and gases and reliable and cost-efficient sources of clean energy. Accordingly, efficient regulatory and permitting processes are critical to the industry's ability to maintain and expand domestic operations, maximize American manufacturing competitiveness, and continue innovating while enhancing protection of the environment and workers. Semiconductors enable technologies critical to advancing energy efficiency, emissions reductions, and environmental sustainability throughout the economy. Ensuring growth in the semiconductor industry itself advances our national energy goals and maintains America's competitive strength.[1]

Challenges

Specialized chemicals, gases, and materials used in semiconductor fabrication possess specific functional attributes needed to manufacture at the molecular scale. Use of certain materials may pose concerns and lack substitutes that currently meet the industry's exacting performance requirements. Semiconductor companies and their suppliers are constantly searching for alternatives, but the invention, qualification, and integration of a new substance into high-volume manufacturing can take years or decades, and in some cases may not be possible. Accordingly, future policies should ensure the semiconductor supply chain has a sufficient runway to allow for an orderly transition to alternative substances.

While the industry employs extensive controls to manage these chemicals, to reduce environmental releases,[2] and to minimize human exposures, the industry needs an effective regulatory system to remain innovative and competitive and to continue to achieve high standards of worker safety and environmental protection. Ensuring continued use of existing chemicals and driving timely approvals of new chemicals are necessary to sustain business operations and continued innovation, and to preserve American leadership in this critical sector. Without access to critical substances that are otherwise readily available abroad, the U.S. will not be able to compete with foreign jurisdictions.

Permitting and other regulatory challenges have created obstacles to accessing sources of carbon-free energy for current and future U.S. fabs, especially when energy demand is expected to soar as companies must move with agility and speed to maintain America's lead the AI race. Given the importance of semiconductor manufacturing, it is critical the industry has access to abundant, affordable, and carbon-free energy.

Recommendations

- **Reform the Toxics Substances Control Act (TSCA)** to advance environmental protections while ensuring the efficient, streamlined review and approval of new substances necessary for innovation in domestic semiconductor manufacturing. Congress should provide sufficient appropriations for the EPA New Chemicals Program to implement this goal.
- **Augment industry and university research** to find suitable alternatives to chemicals of concern, identify effective abatement techniques, and develop methods to detect and treat substances like PFAS or greenhouse gases necessary for semiconductor production.
- **Where restrictions on chemicals or gases are necessary and appropriate, regulations should protect the industry's ability to manufacture and innovate** by providing critical-use exemptions for essential materials and allow sufficient time for research on alternatives, adoption of mitigation technologies, and orderly substitution.
- **Streamline permitting requirements** to site new transmission infrastructure, upgrade existing infrastructure, and ensure access to cost-competitive, reliable clean energy to make American manufacturing as competitive as possible.

[1] Innovation and growth of the semiconductor industry enables substantial GHG emissions reductions in other sectors and throughout the economy; indeed, for every unit of emissions generated by the semiconductor industry, it has helped avoid 5 times more emissions for end-customers. Goldman Sachs Asset Management, "Green Capex Capturing the Opportunities," 2022. gsam.com/content/gsam/us/en/institutions/market-insights/gsamconnect/2022/Green_Capex_Capturing_the_Opportunities.html

[2] For example, the industry has taken measures to minimize emissions of greenhouse gases semiconductor manufacturing in the United States. The semiconductor industry represents about 0.068% of all greenhouse gas (GHG) emissions and about 0.29% of industrial sector emissions in the U.S. The industry's GHG emissions have been virtually flat since 2005, despite increasing output and process complexity. EPA, "Inventory of U.S. Greenhouse Gas Emissions and Sinks: 1990-2022." Similarly, data available in the EPA Toxics Release Inventory (TRI) show the semiconductor manufacturing sector represents only 0.17% of all releases for relevant substances. EPA Toxics Release Inventory (TRI) Program, 2023. https://www.epa.gov/toxics-release-inventory-tri-program. The semiconductor industry has also been a leader in phasing out and reducing use of chemicals of concern in response to evolving science on chemical risks, eliminating substances such as TCE, EGEs, and TCA, which are the chemicals cited as chemicals of concern in industry health studies from the 1980s and 1990s.

Appendix B – Additional AI Policy Recommendations

- **A Strong and Talented STEM Workforce Pipeline**

A talented workforce is necessary for strong semiconductor and AI industries, as well as for other critical sectors throughout the economy that rely on STEM talent, such as energy, medical technology, the Internet of Things, cybersecurity, next-generation communications, aerospace and defense, infrastructure and transportation, and advanced manufacturing, among others. For the economy as a whole, by the end of 2030, SIA and Oxford Economics project that an estimated 3.85 million additional jobs requiring proficiency in technical fields will be created in the U.S. Of those, 1.4 million jobs risk going unfilled unless we can expand the pipeline for such workers in fields such as skilled technicians, engineering, and computer science.[9] Skilled semiconductor and AI researchers, scientists, and engineers are key enablers of innovation within the private sector and the U.S. government, including at DOE National Laboratories. To address this shortfall, the AI Action Plan should incorporate key strategies:[10]

1. Strengthen support for regional partnerships and programs aimed at growing the pipeline for skilled technicians for semiconductor manufacturing and other advanced manufacturing sectors.
2. Grow the domestic STEM pipeline for engineers and computer scientists vital to the semiconductor industry and other sectors that are critical to the future economy.
3. Retain and attract more international advanced degree students within the U.S. economy.

- **Growing America's AI Infrastructure and AI Supply Chain Resilience**

The Trump Administration should build on the progress made by the first Trump Administration[11] and continue advancing America's AI buildout, including for data centers and AI server manufacturing. The Action Plan should also include support for design and manufacturing of hardware necessary for AI, such as semiconductors, and other supporting components.[12]

SIA encourages the AI Action Plan to include demand drivers for U.S.-made semiconductors, such as increased federal spending on AI infrastructure and domestic procurement preferences for U.S.-made chips, from logic and memory to analog and mixed signal, and for all generations, from leading-edge to current-generation and mature-node, in a manner that accounts for the current landscape and existing capacity in the semiconductor supply chain.[13]

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[9] SIA/Oxford Economics, "Chipping Away: Assessing and Addressing the Labor Market Gap Facing the U.S. Semiconductor Industry," July 2023. https://www.semiconductors.org/chipping-away-assessing-and-addressing-the-labor-market-gap-facing-the-u-s-semiconductor-industry/

[10] Additional concrete recommendations are provided in SIA's Workforce Policy Blueprint. https://www.semiconductors.org/workforceblueprint/

[11] Trump White House, "Accelerating America's Leadership in Artificial Intelligence," Feb. 2019. https://trumpwhitehouse.archives.gov/articles/accelerating-americas-leadership-in-artificial-intelligence/

[12] For example, inside the data center, the new large GPU clusters that AI calls for require 10 times more fiber connections than traditional data centers. Given the significant computing demands that come with AI and other emerging technologies, fiber has become the de-facto transmission media across the nation's data center infrastructure thanks to its unequaled characteristics: high speed, low latency, ultra high density, near limitless capacity, security, sustainability, and high durability/reliability.

[13] For example, Executive Order 14141 included a provision requiring "AI developers owning and operating frontier AI data centers on Federal sites either to procure, for use in the development of their data centers, an appropriate share (as measured by monetary value) of leading-edge logic semiconductors fabricated in the United States to the maximum extent practicable; or to develop and implement a plan, subject to the respective approval of the Secretary of Defense or the Secretary of Energy, to qualify leading-edge logic semiconductors fabricated in the United States for use in the developer's data centers as soon as practicable." This type of provision should be broadened to include chips outside of leading-edge logic.

- **Smart Sourcing Procedures**

To foster supply chain resilience within the procurement process of AI systems, we recommend a multi-vendor requirement for AI system procurement. Promoting multi-vendor use in AI system procurement will mitigate supply chain risks of single point-of-failure in critical infrastructure systems and drive innovation.

We also recommend that the U.S. government promote interoperability in the hardware design of AI systems and leverage relevant industry standards on interoperability. Interoperability plays a crucial role in maximizing procurement choice, advancing investment and innovation in emerging technologies, and helps ensure that government systems are suited for long-term viability. This approach not only enhances flexibility but also maximizes the overall effectiveness of existing AI infrastructure investments in compute, memory, and networking, among others, by ensuring systems remain adaptable to changing mission needs.

- **Cybersecurity**

Companies in the semiconductor supply chain are eager to deploy AI in their enterprise, but obstacles to adoption persist related to cybersecurity and data privacy. In particular, companies in the semiconductor supply chain that leverage highly proprietary intellectual property are concerned with the potential for the misuse of the content they input into AI solutions during ordinary operations (e.g., company data, prompts, etc.) in training the vendor's AI model, potentially putting sensitive, proprietary information at risk. The AI Action Plan should address how to ensure that proprietary data is protected, as well as to recognize potential risks of model poisoning. U.S. government-led initiatives to incentivize technological solutions and facilitate public-private development structure, standards, and guidance can support the vetting AI models and advance adoption of AI for companies with high value IP.