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CHIPS:An Unprecedented Opportunity What This Program Means

NASA Electronic Parts and Packaging Program (NEPP)
14th Annual Electronics Technology Workshop (ETW)

Greenbelt, MD, at the NASA Goddard Building 3 Auditorium

Dr. Mike Fritze

Trusted Strategic Solutions

Dr. Mike Fritze: Quickie Bio

- **From Techno-Nerd to Policy Wonk……**
  - 30+ years of experience
  - Current independent consultant supporting multiple clients
  - Focus on USG/DoD Microelectronics Strategy
    - Secure guaranteed access, innovation outreach, USG working with industry, technology transition of USG-funded efforts, PPP Consortia
- **Techno Experience**
  - USC-ISI (2010-2015)
  - DARPA MTO (2006-2010)
  - MITLL (1995-2006)
- **Policy Experience**
  - Potomac Institute for Policy Studies (2015-current)
  - TSS (2022- current)

Education:

B.S. Physics: 1984
Lehigh University,
Bethlehem, PA

PhD Physics: 1991
Brown University
Providence, R.I.

Trusted Strategic Solutions

- **MISSION**
  - Simplify Technology for a complex world
  - We work with commercial, civil and national security entities, providing the foresight and expertise that ensure safety, time savings and financial protections
- **VISION**
  - We aspire to make sure the nation and its allies are never dependent on adversaries for technology
- **VALUES**
  - Mastery – we believe lessons learned and knowledge acquisition allows for the best solutions
  - Discretion – we believe in partnerships built on mutual trust
  - Accountability – we believe we are personally accountable for the work we deliver
  - Credibility – we believe our reputation is of utmost importance

CHIPS Legislation Background & Timeline

- **Dec 2020: Authorized as part of 2021 NDAA**
  - Dept of Commerce, Dept. of Defense, Dept of State
  - Target domestic manufacturing of semiconductors
  - For US economic competitiveness and national security
- **CHIPS Appropriations Efforts**
  - Provided appropriations to implement authorized plans
  - Senate passed “USICA” (US Innovation and Competition Act) in June 2021 (68 – 32) Bipartisan
  - Late January 2022 House passes “America Competes” Act (222 – 210)
    - Reconciliation Process took time
- **CHIPS & Science Act of 2022**
  - Signed by POTUS Aug 9, 2022

Legislation Informed By:

- **Executive Order 14017, "America's Supply Chains," (2/21)**
  - Engaged broadly with 15 stakeholders to inform a 100-day review of the supply chains for semiconductor manufacturing and advanced packaging
- **DOC RFI (3/22)**
  - "Notice of Request for Public Comments on Risks in the Semiconductor Supply Chain," 86 Federal Register 53,031 (Sept. 24, 2021), www.federalregister.gov/d/2021-20348
  - Over 250 responses; Plus workshops & listening sessions
- **Sec Raimondo (DOC) Speech (2/23/23)**
  - *"The CHIPS Act and a Long-term Vision for America's Technological Leadership"*
  - "This money will incentivize companies to manufacture semiconductors here on American soil"
  - Did this program enable us to build a reliable and resilient semiconductor industry that protects America's technological leadership for the coming decades?
  - Where we good stewards of taxpayer dollars ?

CHIPS and Science Act Overview

- **<u>Authorizes</u> a total of $280 billion to boost domestic research and manufacturing of semiconductors. <u>Only Div. A has been appropriated</u>.**

H.R. 4346 Funding

Section	Name	Amount
Division A	CHIPS Act 2022	$54.2 billion
	Investment Tax Credit (ITC) (est.)	$24 billion
Division B	Research & Innovation	$200 billion
	Total for CHIPS & Science Act of 2022	$280 billion
Division C	Supreme Court Supplemental Appropriations	$20 million
	Total appropriations	$280 billion

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CHIPS Appropriations: What we will focus on

CHIPS Act Provisions	FY22	FY23	FY24	FY25	FY26	FY27	Total
Financial Assistance Program (Incentives)	19	5	5	5	5	0	39
National Semiconductor Technology Center	2	2	1.3	1.1	1.6	0	11
National Advanced Packaging Manufacturing Program	2.5						
National Institute of Standards and Technology Semiconductor Metrology R&D	0.5						
Manufacturing USA Institute for Semiconductors							
Department of Defense Semiconductor R&D Network	0	0.4	0.4	0.4	0.4	0.4	2
Department of State Technology Security and Innovation Fund	0	0.1	0.1	0.1	0.1	0.1	0.1
National Science Foundation CHIPS Education Fund	0	0.025	0.025	0.05	0.05	0.05	0.2
National Telecommunications and Information Administration Wireless Supply Chain Innovation Fund	1.5						1.5

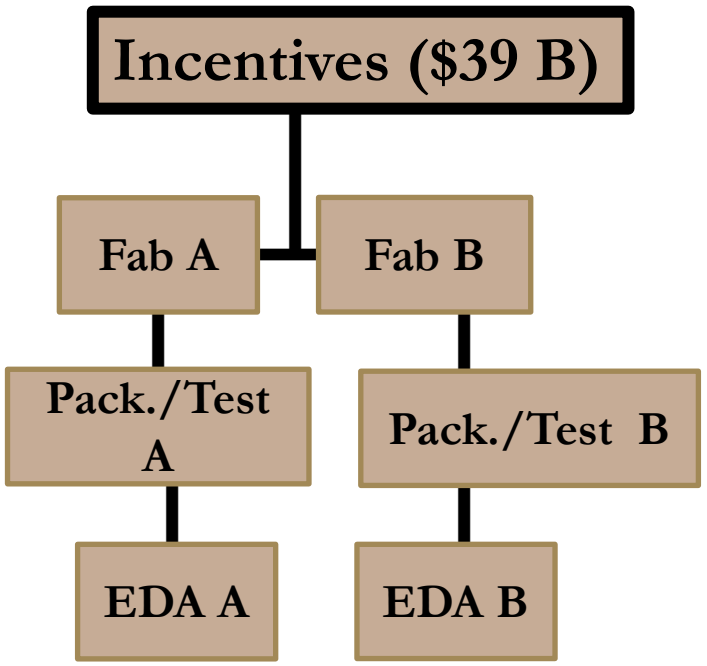
Source: Author's compilation from H.R.4346, 117th Congress.

Investment Tax Credit: $24 B

Source: John VerWay, CSET Policy Brief, 1/23

CHIPS Appropriations: 5-year period

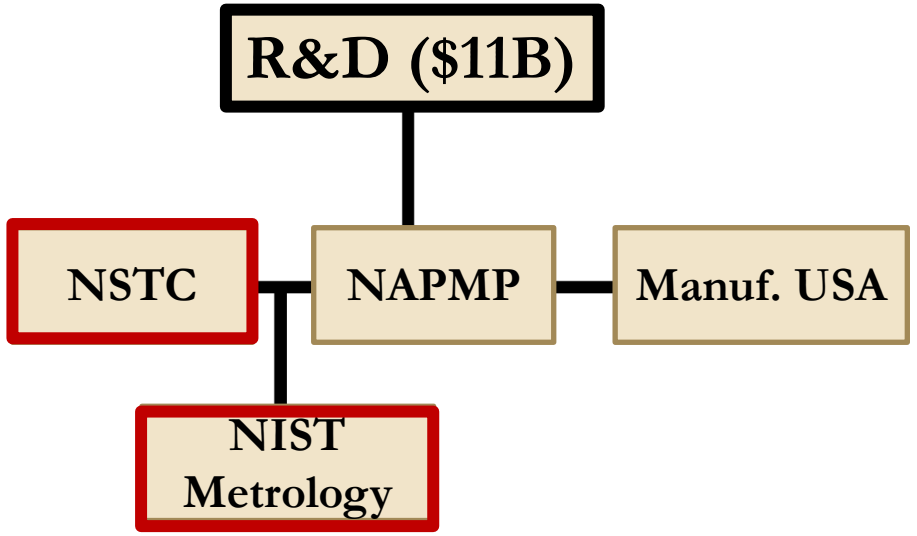
9902



1st NoFo Out:

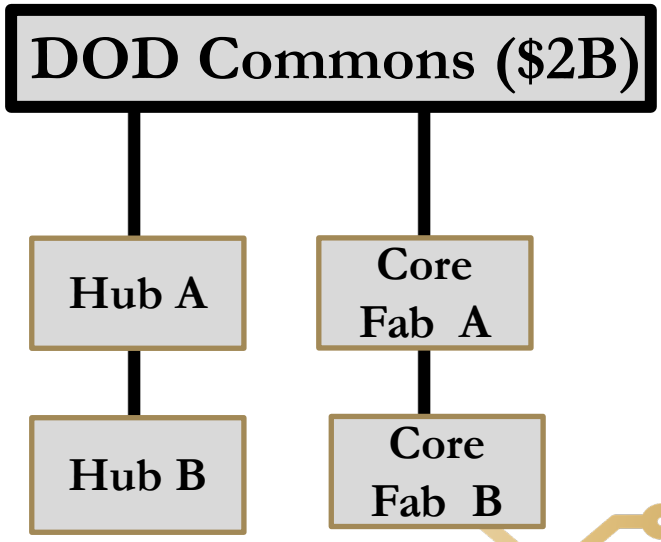
Tranche 1 (Feb) : Fabs
Tranche2 (Spring): Mat. Suppliers, Equipment
Tranche3 (Fall): R&D Facilities

9906



NSTC formation in progress:

WP Vision Out
New independent PPP
Run by non-govt CEO



Currently in Source Selection

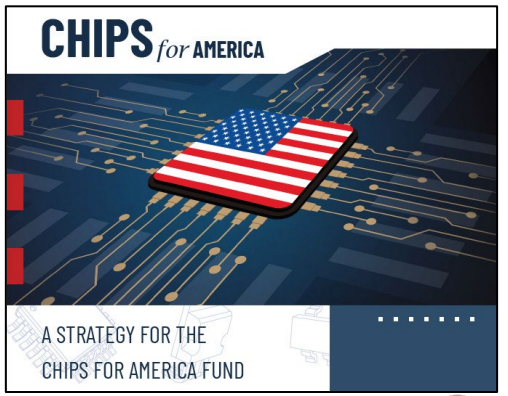
Expected contracts by Aug '23

NSTXL
NATIONAL SECURITY TECHNOLOGY ACCELERATOR

Consortium management firm

CHIPS Legislation: Comments

- **Coordination of various efforts with multiple departments will be important**
  - DOC, DOD, State, DOE, etc
  - Multiple Tech Hubs (DOC Incentives, NSTC PPP, DoD Commons, etc)
- **Execution mechanisms also important**
  - Grants vs Contracts
  - Clawback provisions to discourage bad behavior (ie PRC investments, stock buys, etc)
  - Potential use of DOD Title III authorities
- **Mechanisms for Execution**
  - CHIPS for America Office Leadership Team
  - CHIPS Execution Steering Council
  - DOC Industrial Advisory Board (R&D Part)
  - DOC Strategy Document (9/22)
  - DOC NSTC WP Vision (4/23)



DOC: 9/2022

DOC: 4/2023

DOD CHIPS Commons Solicitation

DoD Seeking Information for Public-Private Microelectronic Commons

Feb. 25, 2022 |

The Department of Defense issued a federal register notice requesting information from academia, startups, small businesses, government labs, and domestic semiconductor manufacturers in pursuit of a public-private partnership that will create regional hubs of microelectronics innovation.

This Microelectronics Commons idea, envisioned by an Under Secretary of Defense for Research & Engineering-led cross functional team, aims to:

- Create "Lab-to-Fab" testing/prototyping hubs to build a network focused on maturing microelectronics technologies
- Provide broad access to these prototyping hubs, potentially through augmented academic facilities (i.e. a local semiconductor company or a Federally Funded Research and Development Center)
- Facilitate microelectronics education and training of students at local colleges and universities, and provide a potential pipeline for an engineering workforce to bolster the local semiconductor economy

NSTXL
NATIONAL SECURITY TECHNOLOGY ACCELERATOR

OPPORTU

Microelectronics Commons

S²MARTS Project No. 22-16

Coming Soon Notice: 15 September 2022 at 12:00 PM ET

DoD specific "Lab to Fab" prototyping

Multiple Research Hubs and Fab Cores structure

Source Selection Now: Results expected Aug '23

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DOC CHIPS References

See CHIPS.gov website

DOC CHIPS News

Industrial Advisory Council Meeting: June 6, 2023 Madison Hotel DC

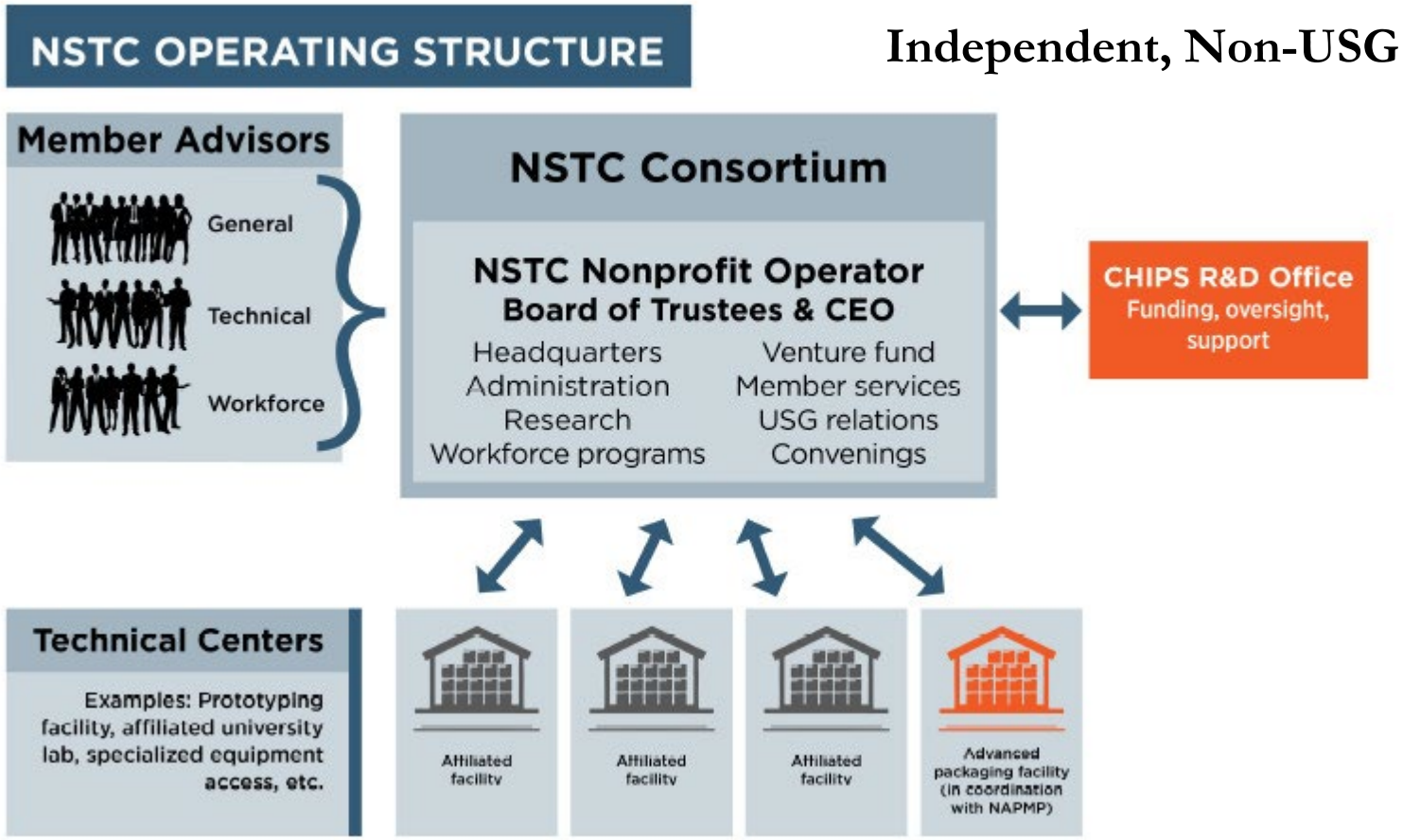
Brief-outs of 4 WGs: Technology Challenges, Org Structure & PPP, Sequencing, Workforce

Recommendations issued

The announced CHIPS Research and Development (R&D) Office leaders are:

- **Lora Weiss,** Director
- **Eric Lin,** Deputy Director
- **Neil Alderoty,** Executive Officer
- **Richard-Duane Chambers,** Associate Director for Integration and Policy
- **Marla Dowell,** Director of the CHIPS R&D Metrology Program

NSTC WP Highlights: Operating Structure



Independent, Non-USG run PPP

NSTC WP Highlights: Program Coordination

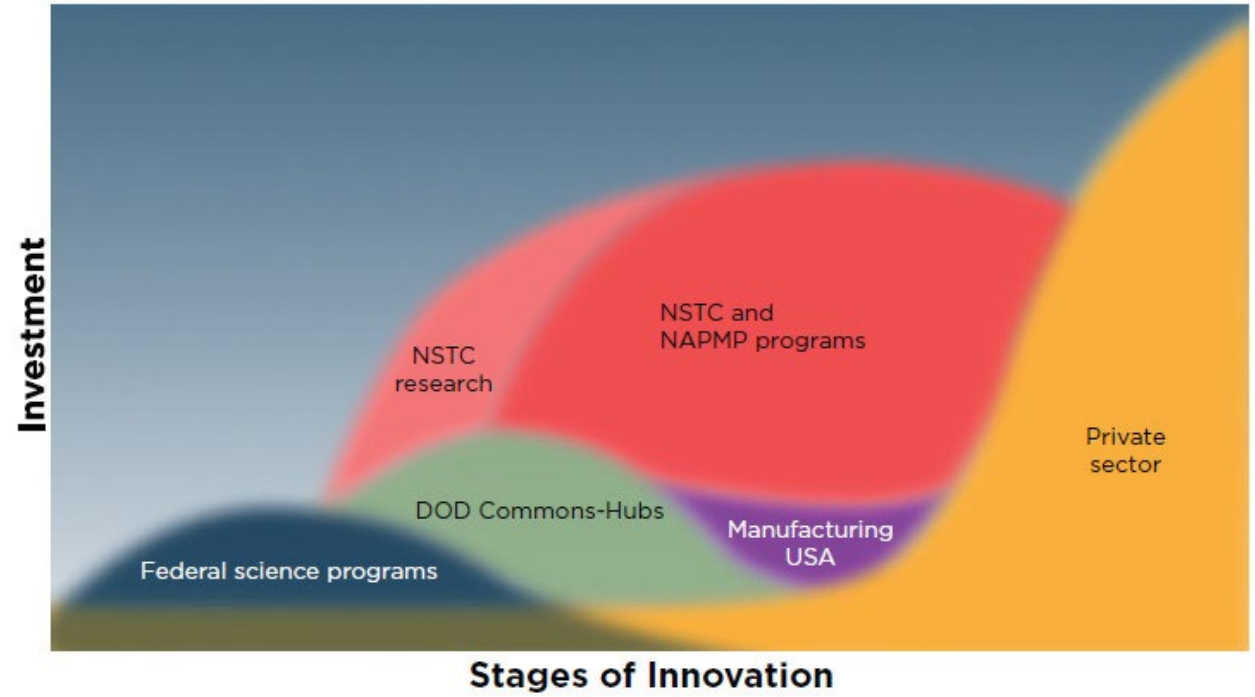


Figure 3. A conceptual diagram of the stages of innovation for a new chip design across various government programs. (Note that the Commons Cores are not displayed. Shading is not to scale of investment.)

DOC Nofo Program Priorities

DoC / NIST Overview of Chips NOFO – 7 Mar 23

Execution Plans for CHIPS For America: Leadership Team

- **National Economic Council:** Ronnie Chatterji
  - Chief economist at DOC
- **DOC CHIPS Program Office:** Michael Schmidt
  - Senior Advisor, Treasury Dept.
  - Senior Advisor: Todd Fisher (Interim; NIST)
    - Program Director for the American Rescue Plan Funds at the Economic Development Administration (EDA),DOC
- **DOC CHIPS R&D Office:** Eric Lin (Interim)
  - MML Director at NIST
  - Manages IAC
- **Senior Council to DOC Secretary for CHIPS Implementation:** Donna Dubinsky
  - Serial entrepreneur and CEO of Palm Computing and then Handspring
- **Senior Advisor to DOC Secretary for CHIPS Implementation:** J.D. Grom
  - Performed the duties of the Assistant Secretary for Legislative & Intergovernmental Affairs, DOC
- **DoD Commons Lead:** Dr. Dev Shenoy
  - OSD(R&E) Principle Director of Microelectronics

CHIPS Implementation Steering Council:

Executive Order 14080 "Implementation of the CHIPS Act of 2022"

- **Assistant to the President for Economic Policy** Brian Deese (Co-Chair)
- **Assistant to the President for National Security Affairs** Jake Sullivan (Co-Chair)
- **Assistant to the President for Science and Technology** Arati Prabhakar (Co-Chair)
- **Secretary of Treasury** Janet Yellen
- **Secretary of Commerce** Gina Raimondo
- **Director of National Intelligence** Avril Haines
- **Director of the Office of Management and Budget** Shalanda Young
- **Administrator of the Small Business Administration** Isabel Guzman
- **Director of the National Science Foundation** Sethuraman Panchanathan
- **Deputy Secretary of State** Wendy Sherman
- **Deputy Secretary of Defense** Kathleen Hicks
- **Under Secretary of Energy for Science and Innovation** Geri Richmond
- **Senior Advisor to the President for Public Engagement** Keisha Lance Bottoms
- **Principal Deputy National Cyber Director** Kemba Walden
- **Director of the Department of Labor's Good Jobs Initiative** Katelyn Walker Mooney
- **Chief Economic Advisor to the Vice President** Deanne Millison
- **White House Coordinator for CHIPS Implementation** Ronnie Chatterji

Met 10/7/22:

Need for coordination
Protect US taxpayer
Workforce issues
Geopolitical competition & NatSec
Strategic Capability/Capacity
Sustaining investments
Whole of USG approach

CHIPS Industrial Advisory Committee (IAC)

- **U.S. Department of Commerce Appoints First Members to Industrial Advisory Committee**
- FOR IMMEDIATE RELEASE
- Thursday, September 29, 2022
- **Office of Public Affairs**
- publicaffairs@doc.gov
- *The recently established committee will advise on CHIPS for America's R&D efforts.*
- The U.S. Department of Commerce today announced the appointment of 24 members to the Industrial Advisory Committee (IAC), an advisory body that will provide guidance to the Secretary of Commerce on a range of issues related to domestic semiconductor research and development in support of CHIPS for America. The Committee will not participate in selecting recipients of federal financial assistance, including the manufacturing incentives program.

My thoughts on CHIPS……..

- **DOC Incentives (9902)**
  - **Which parts of supply chain to focus on ?**
    - Fab, Packaging/Test, Other ?
  - **Clawback provision details**
    - Compensation, stock-buybacks, China investments
    - Profit sharing, etc
    - Access guarantees
  - **Political influence in process**
    - Should be fair competitive process
    - Defendable against protests

GOALS:

- **<u>Level playing field wrt. subsidies (ie 15 % range)</u>**
- Move the needle on domestic fab %
- Strengthen weak parts of US supply chain
- Help create new market for secure ME

Must work ***BOTH capability and demand sides*** to be successful

My thoughts on CHIPS……..

- **DOC R&D (9906)**
  - **R&D organizational structure**
    - NSTC PPP, NAPMP, Manuf. USA
    - **NSTC:** Create new impartial non-USG run PPP
    - Fiduciary board of trustees
    - Light touch coordination w/ USG
  - **Robust Access infrastructure**
    - Design Gateway (shared)
    - Silicon Aggregation (shared)
  - **Research directions**
    - Post physical scaling (ie het. Integration, Customization, etc)
    - Appeal to large member companies
      - System company need opportunities
    - Accessible to Universities, startups and small companies

GOALS:

- **<u>Create new domestic prototyping capabilities</u>**
- Create robust access infrastructure
- Develop post-Moore technologies
- Work together with allies

- **Sustainable business model**
- **Transition to domestic manufacturing**

My thoughts on CHIPS……..

- **DOD Commons**
  - **University-led Hubs**
    - Earlier TRL Work focus
  - **Role of Core Fabs**
    - Prototype Hub concepts
    - Level of emphasis here
  - **Transition of Hub results**
    - DOC CHIPS + Commercial Fabs

GOALS:

- **Explore DoD-specific ME concepts**
- Create new domestic prototyping capabilities
- Transition to commercial production

New RFI Out: 5/17/23

Request for Information - DoD Design to Transition Accelerator

The Office of the Under Secretary of Defense for Research and Engineering (OUSD(R&E)) and the Office of the Under Secretary of Defense for Acquisition and Sustainment (OUSD(A&S)) are seeking information from the domestic microelectronics community to inform objectives for a DoD Design to Transition Accelerator (D2TA) (Figure 1) focused on leveraging commercial activities for microelectronics technology transitions (TRL 4-8) into DoD programs of record.

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BACKUPS

Key CHIPS Bill Details

- **DOC Manufacturing Incentives:** $39 billion in financial assistance to build, expand, or modernize domestic facilities and equipment for semiconductor fabrication, assembly, testing, advanced packaging, or research and development, including $2 billion specifically for mature semiconductors. Within the incentive program, up to $6 billion may be used for the cost of direct loans and loan guarantees.

- **Note:**
- $28 B for leading edge logic and memory chips
- $10B has been reserved for mature and current generation chips

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Key CHIPS Bill Details (Cont)

- **Investment Tax Credit (ITC)—**$24 billion
- At an estimated cost of $24 billion, the act also provides a 25% investment tax credit to companies that invest in semiconductor manufacturing. Based on a bipartisan bill known as the Facilitating American Built Semiconductors (FABS) Act, this credit covers both manufacturing equipment and constructing semiconductor manufacturing facilities.

Key CHIPS Bill Details (Cont.)

- **DOC Research and Development ("R&D"):** $11 billion for DOC research and development.
- **DOC National Semiconductor Technology Center ("NSTC"):** A public-private partnership to conduct advanced semiconductor manufacturing R&D and prototyping; invest in new technologies; and expand workforce training and development opportunities.
- **DOC National Advanced Packaging Manufacturing Program:** A Federal R&D program to strengthen advanced assembly, test, and packaging ("ATP") capabilities, in coordination with the NSTC.
- **DOC Manufacturing USA Semiconductor Institute:** A partnership between government, industry, and academia to research virtualization of semiconductor machinery, development of ATP capabilities, and the development and deployment of training.
- **DOC Microelectronics Metrology R&D:** A National Institute of Standards and Technology ("NIST") research program to advance measurement science, standards, material characterization, instrumentation, testing, and manufacturing capabilities.

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Key CHIPS Bill Details (Cont.)

- **CHIPS for America Defense Fund:** $2 billion for the DoD to implement the Microelectronics Commons, a national network for onshore, university-based prototyping, lab-to-fab transition of semiconductor technologies—including DoD-unique applications—and semiconductor workforce training.

- **CHIPS for America Workforce and Education Fund:** $200 million to kick start development of the domestic semiconductor workforce, which faces near-term labor shortages, by leveraging activities of the National Science Foundation.

- **CHIPS for America International Technology Security and Innovation Fund:** $500 million to the DoS, in coordination with the U.S. Agency for International Development, the Export-Import Bank, and the U.S. International Development Finance Corporation, to support international information and communications technology security and semiconductor supply chain activities, including supporting the development and adoption of secure and trusted telecommunications technologies, semiconductors, and other emerging technologies.

Criteria for Evaluating Applicants

- **Leverage collaborations to build out semiconductor ecosystems**. Collaborations among industry, investors, customers, designers and suppliers are encouraged.
- **Secure additional financial incentives and support.** Applicants will need to show that they will receive state or local incentives. Different types of incentives will count toward this requirement, but there will be a preference for incentive packages with the potential for spill-over benefits, that are performance-based, that have local support, and that maximize regional economic gains and competitiveness, not just benefit a single company.
- **Establish a secure and resilient semiconductor supply chain**. Projects that focus on information security, data tracking and verification and those that address supply chain risks will be prioritized.
- **Expand the workforce pipeline to match increased domestic capacity workforce needs.** The program will be seeking creative recruitment and training efforts and those that are inclusive of populations that have been underrepresented in the industry. Partnerships among employers, training providers, workforce development organizations, labor unions, and others are encouraged. Programs providing paid training, experiential apprenticeships, and wraparound supports such as childcare and transportation are mentioned specifically.
- **Create inclusive and broadly shared opportunities for businesses**. Plans that demonstrate how small and underrepresented businesses will be included in efforts supported by the CHIPS programs will be prioritized.
- **Financial considerations.** Detailed project and company financial data will be reviewed, including plans to ensure the facility remains competitive and viable, an analysis of how the Investment Tax Credit will impact the project, and other considerations.

CHIPS & SCIENCE ACT: Research and Innovation Piece
$200 B
Only Authorized, Not Appropriated

- **National Science Foundation (NSF)**: ~~Invests significant investments in science, including the~~ development of an NSF Directorate for Technology, Innovation, and Partnerships to accelerate the development of national and economic security critical technologies. Additional investments will be made in basic research; building a science, technology, engineering, and math (STEM) workforce; building broad-based research opportunities; and expanding rural STEM education.11
- **Department of Commerce (DOC) Technology Hubs**: The act directs the DOC to create 20 geographically distributed regional technology hubs that will focus on technology development, job creation, and expanding U.S. innovation capacity. Another project will be designed to support persistently distressed communities with economic development activities.12
- **National Institute of Standards and Technology (NIST) Authorization**: This part of the act will advance research and standards development for industries of the future. This will include quantum information science, artificial intelligence, cybersecurity, advanced communications technologies, and semiconductors. Other components seek to support small- and medium-sized manufacturers with cybersecurity, workforce training, and supply chain resiliency. The act also seeks to promote competitiveness in international standards.12
- **National Aeronautics and Space Administration (NASA) Authorization**: Provides authorization for the Moon-to-Mars Exploration Campaign, including the return of America to the moon. Other programs seek to maintain the International Space Station through 2030, extend NASA's enhanced-use lease authority, support NASA's search for life beyond Earth, advance U.S. aeronautics leadership, and enhance NASA's technology, infrastructure, and workforce. The act also invests in ensuring planetary defense, including protecting Earth from asteroids and comets.13
- **Research Security to Protect Federal Investments in the U.S. R&D Enterprise**: This legislation requires the NSF to maintain a Research Security and Policy Office to identify potential security risks, conduct outreach and education to the research community, establish procedures and policies on research security for the Foundation for Energy Security and Innovation at the Department of Energy (see below, under "Additional Department"), and conduct risk assessments of applications and disclosures. The act further prevents federal research agencies from participating in foreign talent recruitment programs.14
- **Department of Energy (DOE)**: Reauthorizes fundamental research and development activities performed by scientists at the DOE, the National Laboratories, universities, and private companies to advance our understanding of the atom, the cell, the Earth's systems, and the universe.15
- **Additional DOE Science and Innovation Provisions**: Establishes a Foundation for Energy Security and Innovation at the DOE to foster partnerships among government, industry, startups, and outside funding organizations to increase funding opportunities from the private sector, accelerate commercialization of technologies, and provide workforce training in energy security and innovation fields.16

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Industrial Advisory Committee

- **Mike Splinter (Chair), General Partner, MRS Business and Technology Advisors**
- **Susan Feindt (Vice-Chair), Fellow, Director of Physical Technology Strategy, Analog Devices**
- James Ang, Chief Scientist, Pacific Northwest National Laboratory
- Daniel Armbrust, Founder/Chief Executive Officer, Silicon Catalyst
- Susie Armstrong, Senior Vice President of Engineering, Qualcomm
- Ahmad Bahai, Chief Technology Officer, Texas Instruments
- Bill Chappell, Vice President of Technology, Microsoft
- Michael Fritze, Vice President of Microelectronics Policy, Potomac Institute for Policy Studies
- Charles Gray, Vice President of Digital Systems Technology, Ford Motor Company
- Carol Handwerker, Reinhardt Schuhmann, Jr. Professor of Materials Engineering & Professor of Environmental and Ecological Engineering, Purdue University
- Deirdre Hanford, Chief Security Officer, Synopsys
- Rajarao Jammy, Chief Technology Officer, MITRE Engenuity

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- Alex Oscilowski, President, TEL America
- Willy Shih, Robert and Jane Cizik Professor of Management Practice in Business Administration, Harvard Business School
- Brandon Tucker, Chief Workforce Development Officer, Washtenaw Community College
- H.S. Philip Wong, Willard R. and Inez Kerr Bell Professor in the School of Engineering, Stanford University
- Anthony Yen, Vice President of Technology and Director of ASML Technology Center

- Here is a summary of TSS. Feel free to use what you want.
-
- Trusted Strategic Solutions, LLC (TSS) is dedicated to addressing the constantly evolving challenges in the field of microelectronics. By providing strategic recommendations to the US government and the semiconductor industry, we aim to mitigate the current situation and ensure that microelectronics can support both traditional and non-traditional applications. Our team is actively engaged in supporting multiple interagency efforts to meet the nation's current and future microelectronics requirements.
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- As global threats continue to evolve, strategic planning is crucial for ensuring the availability, sustainability, security, and qualification of microelectronic components for mission systems. TSS is collaborating closely with the US government and the semiconductor industry to develop effective strategies that can overcome these challenges. We are committed to providing comprehensive solutions that address the needs of our clients and contribute to the advancement of microelectronics technology.