Industrial Advisory Committee (IAC)
Meeting Summary
National Institute of Standards and Technology (NIST)
Washington, DC
(Public Meeting conducted via web conference)
December 8, 2022

Advisory Committee Members:

Michael Splinter, Chair	General Partner, MRS Business and Technology Advisors
Susan Feindt, Vice-Chair	Fellow, Analog Devices Inc.
James Ang	Pacific Northwest National Laboratory
Daniel Armbrust	Silicon Catalyst
Susie Armstrong	Qualcomm
Ahmad Reza Shaikh Bahai	Texas Instruments
William Chappell	Microsoft
Michael Fritze	Potomac Institute for Policy
Charles Gray	Ford Motor Company
Carol Handwerker	Purdue University
Dierdre Hanford	Synopsys
Raj Jammy	MITRE Ingenuity
Kenneth Joyce	Brewer Science
Ann Kelleher	Intel Corporation
Mukesh Khare	IBM
Meredith LaBeau	Calumet Electronics
Tsu-Jae King Liu	University of California Berkeley
Omkaram Nalamasu	Applied Materials
Debo Olaosebikan	Kepler Computing Inc.
Alexander Oscilowski	iTEL Technology Center America
Willy Chao-Wei Shih	Harvard Business School
Brandon Tucker	Washtenaw Community College
Hon-Sum Philip Wong	Stanford University
Anthony Yen	ASML

DOC/NIST Leadership:

Gina Raimondo	Secretary of Commerce
Laurie Locascio	Under Secretary of Commerce for Standards and Technology Director, NIST
James Olthoff	Associate Director for Laboratory Programs (ADLP) & Interim CHIPS R&D Metrology Director
Mojdeh Bahar	Associate Director for Innovation & Industry Services (ADIIS)
Del Brockett	Associate Director for Management Resources (ADMR)
Jason Boehm	Chief of Staff
Ben Davis	Designated Federal Officer
Tamiko Ford	Designated Federal Officer

NIST Presenters (listed in alphabetical order):

Mojdeh Bahar	Interim CHIPS R&D Manufacturing Director
Eric Lin	Interim CHIPS R&D Director

Non-NIST Presenters (listed in alphabetical order):

Dan Armbrust	R&D Working Group Chair, Silicon Catalyst
Ronnie Chatterji	White House Coordinator for CHIPS Implementation, Executive Office of the President
Lisa Friedersdorf	Assistant Director for Microelectronics, Materials, and Critical Minerals, Office of Science and Technology Policy
Dierdre Hanford	Organized and Public & Private Partnerships Working Group Chair, Synopsys
Barry Johnson	Assistant Director for Microelectronics Materials, and Critical Minerals, National Science Foundation (NSF)
Dev Shenoy	Principal Director for Microelectronics, Department of Defense (DOD)

I. Call to Order and Opening Remarks

Mr. Benjamin Davis and Ms. Tamiko Ford, both serving as the Designated Federal Officer (DFO), called the meeting to order and took roll call of the Committee members. Susie Armstrong was absent, and Tsu-Jae King Liu attended remotely, but all other members were present. Mr. Davis then introduced the IAC Committee Chair, Michael Splinter.

Mr. Splinter thanked the Committee for their engagement, emphasizing the level of commitment the Committee has shown regarding the implementation of the Creating Helpful Incentives to Produce Semiconductors (CHIPS) Act. Mr. Splinter stated that the work done thus far was divided amongst three working groups and that the Committee was looking to start at a level of education for this meeting. There would be no final recommendations today, but a progress report on the three Committee working groups would be provided. The R&D Gaps working group, which identifies needed areas of technological investment, is led by Dan Armbrust. The Organization of Public & Private Partnership (PPP) working group, is led by Deirdre Hanford. The final Committee group is Workforce Development, which looks at developing the workforce required to increase semiconductor manufacturing in the US, which is led by Dr. Tsu-Jae King Liu. Mr. Splinter stated that the Committee will hear from these groups today and looks forward to a productive day. Mr. Splinter then turned to Ms. Susan Feindt, the vice chair. Ms. Feindt addressed the Committee and stressed the importance of the mission of this Committee, looking at the challenging issues, and committing to the best for our industry. Ms. Feindt went over the agenda for the meeting and which groups will be speaking, and when breaks will be taken.

II. DOC Welcome Remarks

Mr. Davis, acknowledging that Secretary of Commerce, Gina Raimondo, was delayed and would be speaking later, turned the meeting over to Dr. Laurie Locascio, Under Secretary of Commerce for Standards and Technology and Director of NIST. Dr. Locascio welcomed the Committee and those who attended the meeting. Dr. Locascio stressed the importance of growing the semiconductor industry and stated that the channels of communication to those who are part of the CHIPS Act are clear and help create a strong industry within the country. CHIPS is a program with the bold ambition to bring everyone in the ecosystem together. Dr. Locascio stated she is looking forward to progress, acknowledged the multiple agencies involved, and thanked all in attendance for their work.

III. [CHIPS R&D Update](#)

Mr. Davis turned the meeting over to Dr. Eric Lin. Dr. Lin thanked the Committee. acknowledging that the CHIPS Act is happening at an unprecedented time. Dr. Lin presented an update on the NIST R&D Program. Dr. Lin stressed the need for a continuous, sustained engine of innovation for the microelectronics industry. Dr. Lin summarized the CHIPS Act, stating CHIPS is divided into manufacturing for semiconductors, and investments in R&D. Dr. Lin also stated that the CHIPS R&D Program was working very closely with government agency partners. Dr. Lin stated that the guiding ideal is to build integrated ecosystem as another level in reducing any 'friction' on innovation and increasing cooperation in the U.S. A focus on building partnerships in manufacturing between industry, government, and academia will create

the best chances for success. Dr. Lin acknowledged that all of the working groups saw the Committee's advice as a critical part of moving forward.

Dr. Lin noted that since the passage of the CHIPS Act, there has been significant engagement across multiple agencies, especially through requests for information (RFIs). Two metrology-focused workshops were held, with high levels of representation and engagement. The CHIPS R&D Program highly values the workshop findings, and is working to sustain engagement with stakeholders. Dr. Lin then discussed in detail two of the components of the CHIPS R&D Program.

- National Semiconductor Technology Center (NSTC): The center will serve as a focal point of innovation and leadership for the semiconductor ecosystem. It will serve as an inclusive, open resource and platform, ensuring access barriers will be as low as possible. The center will be an independent public-private consortium that will be developed with a lot of input. Elements identified in the November meetings were discussed in the letter sent out to the Committee, including the need for leverage resources across the country and prototyping capabilities related to scaling and focused on manufacturing. Dr. Lin stated there will be a focus on longer-term efforts over the next five years, not just on immediate needs. Dr. Lin stated that the NSTC is to be a key convening body within the ecosystem. A white paper will be released in the first quarter of the calendar year.
- National Advanced Packaging Manufacturing Program (NAPMP): To strengthen semiconductor advanced test assembly and packaging capabilities in the domestic ecosystem, leveraging public-private partnerships. This will involve taking a close look at different technology areas within this industry sector. The current list presented is a summary, not a full list, showing the industry's potential, and areas to be focused on. Those involved in the Program will identify areas that still need to be developed and will leverage as much of the industry as possible.

Mr. Davis then turned the meeting over to Mojdeh Bahar, the Interim CHIPS R&D Manufacturing USA Director. Ms. Bahar covered the Manufacturing USA institutes, including illustrating what the network's model is and how it works. Manufacturing USA institutes are public-private partnerships where technology at Technology Readiness Levels (TRL) 4–7 of industry, government, and academia work together in a pre-competitive space.

Mr. Davis brought a pause to the presentation at the arrival of Madam Secretary Raimondo, who then addressed the Committee. Ms. Raimondo greeted the Committee members, then thanked the assembly. Ms. Raimondo compared the Committee to her experience as the Governor of Rhode Island when she gathered experts to help inform her initiatives as governor. Ms. Raimondo stated that the CHIPS program is a high-level priority at the White House and that President Biden is thankful for these efforts. Ms. Raimondo stated that the Administration acknowledges the innovation and R&D strategy of the Committee will directly affect the American economy by highlighting the incentives for the industry, the importance of R&D, and building a roadmap to success. Ms. Raimondo stated that the focus on the R&D Roadmap, the workforce, and building national capabilities will lead to success in the future. She also emphasized the value and impact

of public-private partnerships.

Ms. Raimondo provided highlights from her economic speech by outlining four key elements:

1) Investing in America, protecting semiconductor technology, renewing public-private partnerships, calling the private sector to step up, and working with the Administration;
2) nudging the TSMC (Taiwan Semiconductor Manufacturing Company) to do more and fulfill the opportunities for a massive microchip plant or GigaFab in the U.S.;
3) leaning into education and trade skills training; and
4) changing the way we teach engineering in America so more women, people of color, and lower-income individuals stay in engineering programs.

Ms. Raimondo referenced the success story in Rhode Island of women and people of color who improved their Advanced Placement (AP) science test scores and stated this was very important to America's future. She thanked the Committee and assembly once more and then departed.

Mr. Davis turned the meeting back to Ms. Bahar. Ms. Bahar stated that Manufacturing USA institutes leverage the expertise of industry and academia, allowing white papers and roadmaps to be made. NIST held an Advanced Technology Roadmap Grant Competition to help illustrate the best way for the industry to move forward. A Request for Input (RFI) was published, which requested input for what topics the industry believes will work best for the Manufacturing USA institute. This RFI will inform how the program will move forward.

Ms. Bahar then turned the meeting to Dr. James Olthoff, Interim CHIPS R&D Metrology Director, who discussed the CHIPS Act, NIST metrology, and the power of measurements and standards. Dr. Olthoff stated that measurements and standards are a driving force in microchip technologies. Dr. Olthoff stated that this program is focused on breaking into four major focus areas: grand challenges; broad-based awards and partnerships; workforce; and instruments and facilities. Dr. Olthoff stated that the group benefited directly from workshops, which led to the development of the NIST report and clarified the grand challenges the industry needs to overcome to advance their applications. The process consolidated 32 paths down to 20 programmatic areas, which created two cluster areas. One cluster was IT and standards, and the second cluster focused more on the material aspects of the industry, including real-time data and infrastructure. Other areas will be developed along the way and will support the entire industry, but will focus primarily on R&D.

Dr. Lin closed out the presentation on the capacity to meet the larger goals of the CHIPS Act. He stated that focusing on the different ways to advance not only the industry, but the greater ecosystem, including coordinating with international partners, is vital to success. Dr. Lin emphasized that R&D can be mobilized and leveraged to find specific program areas to enhance. Dr. Lin also highlighted the importance of creating an active dialogue and finding commonalities and stated these conversations are not separate, distinct, or conducted in isolation. Dr. Lin discussed interagency coordination to give a sense of the greater breadth and scale and to identify the many ways to assist and support the ecosystem with as large an impact

as possible. Dr. Lin gave some examples of the support received.

Dr. Lin used an example of a question that was asked about the difference between the Department of Commerce (DOC) and DOD Microelectronics Commons programs. Dr. Lin showed both programs are focused on building prototyping facilities, advancing technology through the Valley of Death, and both utilizing resources available to participants. Dr. Lin stated that the difference is that DOC programs are focused on the industry. DOD programs focus more on government needs. DOC follows a coordinated, integrated path that targets and focuses on specific purposes and alignment timeframes. Dr. Lin stated that they were focusing on the DOD Microelectronics Commons program and the NSTC, adding that both will be launched in the new calendar year. Dr. Lin discussed alignment frameworks, focusing on:

- Road mapping
- Leadership execution management
- Resource coordination
- Access coordination

Dr. Lin illustrated an interagency program/dynamic ecosystem scenario, to be tailored to each industry, showing how the various programs work together. He showed how an auto manufacturer could work with the NSTC to be brought into the system to increase avenues and their benefits. This created a successful pathway to the Foundry, defense programs, and the commercial sector for auto manufacturing. Dr. Lin emphasized taking a stakeholder point of view, instead of having stakeholders navigate the structure.

Dr. Lin highlighted several next big steps, including an NSTC white paper to be released in the first quarter of 2023, with more information available at CHIPS.gov. He encouraged attendees to read the CHIPS implementation strategy and to join NSTC's mailing list. Dr. Lin stated CHIPS provides an exciting opportunity to innovate new ways to manufacture. He gave room for questions and answers.

Questions and Answers:
Q. How do different people from different teams work together?
A. Dr. Lin replied that this is a challenge. At the end of the day, it comes down to people and having people look for a way to find access, including through possible open-source tools. Ideas are available, including centers. No specific answer but very dedicated people.

Q. Is there a formal interagency working group looking for industry opportunities?
A. Dr. Lin replied that co-sharing is occurring at a policy level and additional staffing will be required. NIST asked the NSTC and other entities to lean into this approach of co-sharing and to also design a formal group and build a culture to get the details right.

Q. Working with allied and friendly countries is important to the success of the program. How can this be seen in working with friendly nations?
A. Dr. Lin replied that there are like-minded partners who understand the value of research, and values such as transparency and reciprocity. He stated that industry consensus is fruitful and that specifics are to be determined, as many other countries are in an early stage for their

versions of the US CHIPS Act. He added that the government is in contact with other countries through several existing fora.

Q. Regarding focus areas, what are the next steps? What are NIST's workforce development ideas?
A. Dr. Olthoff replied that the first step is to conduct a deep dive into the ten areas identified to find the needs and how to address them, which NIST has not established yet. The next step will involve finding fundamental research and impacts. In terms of workforce, NIST works on a small scale but plays a large role in the PhDs and the impact in quantum computing areas. NIST wants to engage with institutions and build a program to build the concepts. NIST has another program to be fully developed, using graduate students, academics, government, and industry.

Q. Is there an overlap by design between the NSTC and DOD ME Commons?
A. Dr. Lin replied that is some overlap in terms of the types of capabilities to support, but great care is being taken to ensure that there is not duplication and that we are not reaching any overcapacity for any capability. We are working diligently to look at what matches properly and get all programs working at the same time to allow close alignment.

Mr. Splinter thanked the presenters.

IV. [R&D Working Group Update](#)

Mr. Davis turned the meeting over to Dan Armbrust, the R&D Working Group Chair from Silicon Catalyst. Mr. Armbrust stated that it was an honor to be a chair of the group and work once more with colleagues. Mr. Armbrust stated that to set up expectations, this presentation was a progress report. Mr. Armbrust stated that there were no recommendations, as expected, and moved on to the present. Mr. Armbrust stated that there were three charges for the working groups.

- The first was addressing R&D gaps by going after ecosystem issues that were long-standing, more affordable, and could be done well.
- The second was framing the gaps in research and ecosystems and providing recommendations on how the CHIPS Act could address those areas.
- The third was developing these recommendations involved working with academia, industries, startups, and startup incubators to rapidly wrap up recommendations.

The working group met virtually and set expectations, discovered expertise was missing, established who they wanted to hear from, and charged everyone to go through the grand challenges and find the gaps through experiences. This included condensing information, synthesizing information, and looking forward to breakout team discussions and plans to interact in late January and early February of 2023. The working group formed a series of questions about U.S. leadership and innovation, which are addressed in the presentation.

Mr. Armbrust then discussed the working group's status. Four meetings have been completed, including prepared materials. There are currently 14 members, with a 97% attendance rate. The remaining members were provided with recordings and documentation of each of the meetings,

including various suggestions and thoughts. Mr. Armbrust stated that these meetings were built on a very significant body of thoughts, including documents showing progress. Industry and agency white papers were assembled and utilized frequently.

Mr. Armbrust acknowledged some areas are not up to date and that a first round of 15 sessions will be held to record 20-minute sessions and document questions. He stated it is nearly impossible to record more efficiently, so questions will be documented in round 1. Round 2 will deal with further gaps as they are discovered. Mr. Armbrust stated that recordings will be made available. Three breakout teams were made to draft recommendations, but they are not ready to share all recommendations. He reiterated that this is on schedule to be completed by February 2023, but the team will likely do this in late January. Mr. Armbrust added that startups require very clear prioritization, and clarity on what needs to be done to ensure startups are not overwhelmed. Startups can leverage a fresh beginning and benefit from not having to halt other projects. The intention through January is to consolidate recommendations from the working group to be sent to the IAC, then DOC.

Questions and Answers:
No questions were asked.

V. [Organizational and PPP Working Group Update](#)

Mr. Davis turned the meeting over to Ms. Deirdre Hanford, the chair of the Organized and Public & Private Partnerships Working Group from Synopsys. Ms. Hanford thanked the Committee and illustrated who the working group responds to and answers to. Ms. Hanford stated that this was a big job and that they were at the end of the beginning of the group, acknowledging that there is much work ahead of them. Ms. Hanford stated that they started and listened carefully to what DOC had to say and drove supporting national security and economic security. Ms. Hanford stated that the working group had a great cross-section of members, drafted additional members, and represented cross-industry fields. Ms. Hanford stated that the working group's charge is three-fold and includes many organizations.

- Fold 1: Studying the landscape and how puzzle pieces work together.
- Fold 2: How the governance is established and structured for NSTC and the National Advanced Packaging Manufacturing Program (NAPMP).
- Fold 3: Public-private partnerships and stacking work.

Ms. Hanford stated that a white paper is coming in the first quarter of 2023, which addresses how input matters with both governance and commerce, and where to spend time and energy in the short term. Ms. Hanford stated that the paper points out many details in the implementation, and it asks what some of the first set of decisions are to be made and how they support that with their input. Ms. Hanford stated that they started baselining as a team, having a variety of perspectives, and some team members having been involved in CHIPS since its inception and focused on leveling the playing field of knowledge and perspective within the workgroup. The working group has access to many briefs already and needs to carefully digest that information. Ms. Hanford expressed her gratitude for the thought leaders who took deep dives into the

issues. She stated briefs were held in November and December, including colleagues from Intel and DOD, who added their perspectives. She stated the working group is currently hoping to hear from IMEC for input on how not to mimic the governance model but utilize and customize it. This would include constructing a host of questions, then laser-focusing on where to go next. The general grouping of the questions is as follows. The questions are also illustrated in the presentation:

- Charge 1: How do these factors and state programs work with and mesh with each other? How do we engage as an invested community?
- Charge 2: Governance: what problems can we learn from the past, what do we have to address with governance, and how to involve critical stakeholders?
- Charge 3: A holding place for more questions to follow.

Ms. Hanford stated that questions need to be narrowed down to the short term and that the working group had a quick meeting in November.

Mr. Splinter thanked the presenter and opened the meeting to questions.

Questions and Answers:
No questions were asked.

VI. Workforce Working Group Update

Mr. Davis turned the meeting to Dr. Tsu-Jae King Liu, Chair of the Workforce Working Group, who was present virtually. Dr. King Liu apologized that she could not be there in person and provided a brief update. Dr. King Liu acknowledged members of the Workforce working group for their work and described what the working group is looking to add. Dr. King Liu addressed the Workforce Working Group's charge:

- Examine workforce needs across the U.S. microelectronics industry, and review programs that will increase interest and lead US R&D and manufacturing.

Dr. King Liu addressed the need to build the leaders and innovators of tomorrow. Dr. King Liu stated that the working group reviewed numerous documents from multiple sources, including reports from the semiconductor industry and the government. She stated it was very clear that the semiconductor workforce is represented in 49 states and that factory workers will be contributing more and more to industry. One of the questions the working group asked was what kind of degrees are needed. She stated that manufacturers and fabricators, who comprise about half the workforce, needed less than a bachelor's degree, and the remainder of the workforce will need bachelor's and master's degrees.

Dr. King Liu then summarized the talent shortage and attrition and stated there is a growing gap. The problem is compounded, as science, technology, engineering, and mathematics

(STEM) graduates are declining and showing less interest. The working group recognizes that the need is broad and deep and wants to fill out the membership from industry and add representation from trade and industry, minorities, and undergraduates, including faculty from community colleges. Dr. King Liu stated local governments could contribute support, so they need their representation as well. She added that the size of the need is a large challenge. Dr. King Liu stated the working group will take inventory of existing programs, interview experts with more time dedicated to asking questions and identifying gaps, and finalize a summary with drafted recommendations in the first quarter of 2023.

Mr. Splinter thanked the presenter and opened the meeting to questions.

Questions and Answers:
No questions were asked.

The meeting broke for lunch and reconvened at noon ET.

VII.   CHIPS Act Implementation and Interagency Coordination

Mr. Davis then turned the meeting over to Dr. Ronnie Chatterji, the White House Coordinator for CHIPS Implementation, Executive Office of the President. Dr. Chatterji began by stating he is honored to work with the Committee, including working on several advisory meetings, and that there is a huge impact. Dr. Chatterji stated he is placing a challenge on and looking for great potential and opportunity in this Committee. Dr. Chatterji stated this Committee is different from other committees, as so much effort is put behind it, including money. Dr. Chatterji stated he is working to make CHIPS work together and that $50.2 billion is being put toward CHIPS, with $11 billion toward R&D, including more for the DOD. He added that inclusion between DOD and DOC is important in creating effective synergy. Dr. Chatterji stated this is accomplished by building an ecosystem to build microchip plants (fabs). He added that tax incentives will aid in this task, with guidelines built with the Department of Treasury. He currently works to make sure all aspects of the CHIPS Act work with each other and with the government's involvement.

Dr. Chatterji stated the CHIPS Act matters to every American and has bipartisan support. He added that this is a huge investment in the nation's infrastructure. Dr. Chatterji then illustrated the challenges to the CHIPS Act.

- Disruptions to the supply chain.
- Microchip scarcity affecting and contributing to inflation.
- Many companies do not know where microchips are being built.

Dr. Chatterji stated the CHIPS Act tries to address these areas, including by building more fabs to improve our supply chain. 12% of semiconductors are currently being manufactured in the U.S. Dr. Chatterji stated R&D is vital to creating a lead and NIST is the most valuable part of the CHIPS Act. He stated access to these resources must be interconnected and that connections must be made between partners, DOC, and DOD to integrate further innovation. Dr. Chatterji further stated that manufacturing fabs are needed. Mr. Chatterji is working to make sure DOD

and DOC are working in tandem with each other and CHIPS. He then stated building a base for DOD is different from building a base for DOC, and that common ground can be built. He added that private and federal sectors lead to collaborative success, using the National Aeronautics and Space Administration (NASA)'s prior successes as an example. He further stated it was inspiring to see President Biden sign the CHIPS Act and that he wants Committee members to be innovators and builders.

Mr. Splinter thanked the presenter and opened the meeting to questions.

Questions and Answers:
Q. What is the role of like-minded countries?
A. Dr. Chatterji responded that we are seeing the same issues with our allies and partners. We develop institutions to facilitate these discussions, such as the Technology and Trade Council (TTC) with the European Union. Every other company is developing its programs for chip manufacturing. R&D is a team sport. Large teams work better with complex infrastructure and by working across borders. International collaboration is necessary. We can learn from our history and our allies.

Q. A lot of great work in DOD: how did they get coordinated with various technologies?
A. Dr. Chatterji responded that DOD accomplished this by thinking about the program and having a scope of what's being done in the government. He added that NIST should have a strong coordinating role.

Q. Is it equally important where the chips are made?
A. Dr. Chatterji responded that semiconductor production is very complex and is important in the development of these programs.

Q. R&D should be linked and there should be access to that infrastructure. Any thoughts on how to execute it?
A. Dr. Chatterji stated yes, but not sufficient time to be discussed in this forum in detail.

Q. Does the Administration know the vulnerabilities we have?
A. Dr. Chatterji responded yes, this is important, and a key component that is taken into account in the current strategy.

Mr. Splinter thanked Dr. Chatterji for his time.

VIII. [Update on Microelectronics Leadership Strategy](#)

Mr. Davis then turned the meeting over to Dr. Lisa Friedersdorf, Assistant Director for Microelectronics, Materials, and Critical Minerals, of the Office of Science and Technology Policy. Dr. Friedersdorf addressed the Committee and stated they will be getting into the R&D details. She stated she was excited to see where this will go for these groups and to see timelines. Dr. Friedersdorf started by looking at the CHIPS Act as a whole, including innovations and supply chains, the specialized infrastructure, and prototyping. She stated it is a

whole-of-government effort and that agencies have been working closely together, even before funding arrived. Ms. Friedersdorf said there was a focus on the section of the CHIPS Act devoted to advanced microelectronics R&D and that the subcommittee was co-chaired by the Office of Science and Technology Policy (OSTP), Defense Advanced Research Projects (DARPA), and NIST. She discussed the makeup of the subcommittee, including the body responsible for developing the National Strategy for Microelectronics Research. Dr. Friedersdorf stated that, in addition to the CHIPS provisions which provide many resources that play a role in the semiconductor industry, they were looking at all the government processes. She stated this intersects with other initiatives, she recognizes the importance of those intersections which are part of the subcommittee, and that there are multiple agencies involved in these efforts and best practices.

Dr. Friedersdorf stated that, in consultation with these agencies, this Committee is looking to accelerate the domestic development and production of microelectronics and strengthen the domestic microelectronics workforce. Dr. Friedersdorf stated key trends were discovered in interviews and one-on-ones. Some of those trends are the diversity of devices and applications, comprehensive uses, integrated design, and U.S. microchip ecosystem innovation, access to well-developed talent is a challenge across the supply chain, strong engagement with allies and partners, and improving energy efficiency increasing the sustainability and safeguarding intellectual property (IP) to sustain private R&D investment. Dr. Friedersdorf acknowledged there were many pieces and many elements connected, and many systems must work with one another for the ecosystem to function. Programs such as DOD Commons and NSTC need to make sense together and it was critical to the ecosystem's success. She stated the R&D system is looking at all pieces, including large and small businesses, state, and local governments, and internationally. She added that the semiconductor industry is complex and involves multinational distribution and that there is a need to work closely with international partners. She also stated artificial intelligence (AI) is driving innovation, and that the R&D ecosystem must be strengthened. Additionally, reports emphasize the need for closer collaboration from algorithms to packaging, including a need to look at every stage and conduct infrastructure-intensive research.

- Infrastructure: Dr. Friedersdorf stated user facilities for R&D and lab-to-fab infrastructure are required to accelerate innovation. Facilities located in universities and federal labs need to be connected to prototype labs and manufacturing to prevent prototyping and later-stage infrastructure gaps. She emphasized not losing sight of these facilities for training and education situations and instruments.

Dr. Friedersdorf pointed out that in September of 2022, OSTP released the National Strategy on Microelectronics Research, and that this will fuel future research, expand the workforce, and facilitate the rapid transition of R&D to the U.S. industry. She then discussed the key strategies:

- First Goal: To support advancing materials with an emphasis on systems and coordination with materials and hardware needs, as well as research into the tools.
- Second Goal: Export and expand access to the R&D structure. Researchers are struggling with later-stage prototyping, key strategies, and flexible design tools. Facilitate researcher access to vital materials. The strategy is to expand the workforce

and the growth of microelectronics for students, including education from K-12 to the engineering and Ph.D. levels. Competition for talent exists in the labor pool across labor levels.
- Third Goal: To facilitate rapid transition and collaboration across the pathways and engage the private sector.
- The Final Goal: Build out and bridge these factors.

Dr. Friedersdorf asked, how do we build these prototyping facilities and network with each other, ensuring there is seamless access for innovators? In the RFI, questions were asked, and we received an impressive response from the private sector. Dr. Friedersdorf stated the working group is currently going through responses.

Mr. Splinter thanked Dr. Friedersdorf and opened the meeting to questions.

Questions and Answers:
Q. In what form would you accept comments on the national strategy OSTP developed?
A. Dr. Friedersdorf responded that input in any form is welcome. This working group and others providing feedback are appreciated and the feedback informs the strategy.

Q. How do we evaluate what will not be done?
A. Dr. Friedersdorf stated it's a lot of money and must be invested wisely. We need to prioritize, collaborate with the industry, and use road maps to inform the work.

Q. Any part of recommendations on what needs to be started?
A. Dr. Friedersdorf responded that looking at the entire federal landscape of R&D, and looking at unrelated cycles going through their landscapes, will be a part of their evaluations.

Q. Is there a continuous mechanism to inform the strategy on what's not working and what is?
A. Dr. Friedersdorf stated this strategy was written some time ago and has been updated and evolved. She stated that the Committee is looking at implementing this strategy but has not gotten far enough on how to develop implementation and internal roadmaps. We need to be cognizant, look at what's best for the ecosystem, foster strong industry collaboration, be informed, and prioritize investments.

Q. Have you thought about how success will be measured?
A. Dr. Friedersdorf stated, we have contemplated this but don't have anything specific to address.

Q. Any timeline for Version 1.0?
A. Dr. Friedersdorf stated there is no timeline as of right now.

Q. requires small companies who can work with them and create microchips. How are we addressing the supply chain shortcomings of materials?
A. Dr. Friedersdorf responded that it is being looked at currently.

Q. Given the importance of microelectronics, is it time to elevate the importance of the

Committee?

A. Dr. Friedersdorf stated the Committee is well supported with other initiatives and they have the support they need at this time.

IX. **National Science Foundation (NSF) Approach to CHIPS**

Mr. Davis then turned the meeting to Dr. Barry Johnson, the Assistant Director for Microelectronics Materials, and Critical Minerals at NSF. Dr. Johnson began by stating he was looking forward to conversation and engagement. Dr. Johnson prefaced that he was to be the point of contact for CHIPS and that NSF is addressing the CHIPS activities, workforce, and R&D. Dr. Johnson discussed some of the agency's history. He pointed out that the agency's mission since 1950 is to ensure and advance the health and defense of the nation. NSF previously had seven directorates, and multiple integrated programs. CHIPS helped create a new Directorate: The Directorate for Technology Innovation and Partnerships (TIP). TIP is focused on lab-to-market activities, advancing key technologies, addressing societal needs, and accelerating the translation from lab to market.

Dr. Johnson stated over 40,000 graduate students are supported by NSF and are leveraged to move forward and build the future workforce. This includes NSF reviewing and identifying programs to immediately support CHIPS, having a working group, and identifying other means help support to the CHIPS Act. This includes:

- Helping identify gaps and creating programs.
- Expanding grants and advancing the work of grad students, doubling down on partnerships.
- Helping enable the goals of the CHIPS program and making additional investments to enhance the CHIPS Act program, the Advance Technological Program, and training programs.
- Creating scholarships for STEM in the semiconductor industry to help students from the community college to graduate levels. PhDs represent 75% in the industry, trained to be academic, and not hands-on, and creating a program that can fund an internship to enable a hands-on experience for the student is important. 1,400 internships are already funded, which is excellent and gives students an experiential opportunity in the industry.
- Using research, such as Future of Semiconductors (FuSe), to help drive the need to create new materials, devices, and systems. Dr. Johnson also discussed the various other programs that will be applied to the CHIPS Act.

Dr. Johnson pointed out that investments in startups should not be ignored and that the Small Business Innovation Research (SBIR), a program that has been running for 40 years, equals 95% are small businesses. He states NSF wants to invest in technology risks to increase interest in the private sector. This includes tracking smaller businesses and doubling down on partnerships by providing $10 million for Intel and Micron, and funding for entrepreneurs to further innovate within the CHIPS program. Dr. Johnson concluded by discussing the acceleration of partnerships with NSF in the semiconductors industry.

Mr. Splinter thanked Dr. Johnson and opened the meeting to questions.

Questions and Answers

Q. In the programs, how much of that is CHIPS funding?

A. Dr. Johnson stated, none for the programs shown here, CHIPS provided an additional $200 million over five years. Expansion is possible if Congress appropriates funds.

Q. Small Business Innovation Research (SBIR) program for startups: what's your thinking about meshing programs?

A. Dr. Johnson stated NSF is trying to better engage with private investment communities. Phase IIB (see presentation), adds 50 cents on the dollar, to help give them the equity needed.

Q. From the standpoint of translational impact, share thoughts beyond partnership models about how to bridge value down.

A. Dr. Johnson stated the valley of death is there. NSF is focusing on transitional impact and funding a university for a proof of concept to show commercial potential. Innovation Corps (I-Corps) is focused on aligning ideas with market needs. Most startups fail due to creating ideas that no one wants. I-Corps helps startups find market needs. Mr. Johnson mentioned a new program, Pathways to Enable Open-Source Ecosystems (POSE), that creates pathways to create open-source ecosystems and make them available collectively. Make this easier for the entrepreneur. The POSE program has been open source with 24 awards so far.

Q. For the Experimental Learning for Emerging and Novel Technologies (ExLent) Program, is there a mix of community and 4-year colleges?

A. Dr. Johnson confirmed there is a mix of community and 4-year colleges. The program enables those in the workforce to pivot to new workforces. ExLent is another program to help those just out of high school that community colleges can take advantage of.

X. Department of Defense's Approach to Chips

Mr. Davis then turned the meeting over to Dr. Dev Shenoy, the Principal Director for Microelectronics, DOD. Dr. Shenoy discussed the importance of the Commons in microelectronics. He stated requests for solutions (RFS) shall take precedence. He explained microelectronics is about translating from academia to manufacturing, lab to fab, and the Commons plans to overcome those hurdles. Dr. Shenoy stated closely coupling R&D with manufacturing is crucial in protecting IP in the U.S. He acknowledged that there are barriers such as access to the fabs and exorbitant prices for a smaller business. Dr. Shenoy stated IP for designs costs significantly more than in the past, which is another obstacle to overcome, including domestic access being very limited. Dr. Shenoy stated being onshore in the U.S. is necessary to support the semiconductor ecosystem. He further stated they cannot innovate without a workforce and that the workforce is vital to these capabilities. Dr. Shenoy stated that to sustain working relationships for the ecosystem, manufacturing facilities, interagency partners, and all stakeholders that matter within the ecosystem, need to be partners.

Dr. Shenoy discussed rapid lab to fab prototyping, which is one of the paths forward to get ahead of the competition. He stated that the educational and industry needs are understood. Dr. Shenoy then presented the valley of death for a lab to fab for manufacturing and prototyping. Dr. Shenoy pointed out that startups and incubators need to be included in the conversation

from the very beginning. This includes commercial technologies and electronic warfare. He pointed out that venture capital is not the best place for capital and that the Commons will be the hub for networking. There are valid stakeholders, such as defense contractors and programs, which need to be informed of what these opportunities are from day one, and the Commons addresses this. Dr. Shenoy illustrated the evolution from concept to product, with an emphasis on bringing commercial companies to the tech demonstrations. He stated this will ensure a path forward for the technology and stated they need to cross the valley of death for a lab to fab model to be successful.

Dr. Shenoy then discussed the hubs in ensuring local economies are strengthened, such as colleges, startups, and incubators. He pointed out that any entity can be part of a hub and want to make sure it is successful, including core fabs, but also development fabs, such as AI and hardware. Dr. Shenoy stated development fabs, such as new materials and processes, are vital to the life of the semiconductor ecosystem. He added that there is a need to bridge the production fabs and the development fabs. Without infrastructure, there is no success for the Commons, so the Commons will support the infrastructure. He added that the role of projects will be to support, facilitate, build, develop, and challenge the infrastructure. Dr. Shenoy stated the Hub Models illustrate the gaps where resource sharing is needed, illustrate where the workforce is, and support a self-sustaining environment for the Commons network. Encouraging hubs to reach out to underserved and minority communities is key. Dr. Shenoy highlighted that it would take top talent to manage these hubs, 400 million per year, so we need effective management of cores and hubs. Dr. Shenoy stated the hubs need a flexible management model, which includes leveraging an existing financial instrument, including a non-profit consortium. The Commons will bridge the lab to fab gaps, capitalize on innovation, boost the local economies, and ensure a robust supply chain.

Mr. Splinter thanked Dr. Shenoy and opened the floor to questions and answers.

Questions and Answers:
Q. How do these hubs differ from manufacturing institutes?
A. Dr. Shenoy responded that the one difference is the Manufacturing Innovation Institutes (MIIs) as the units of hubs and cores. The hubs and cores allow for the flexibility to be anywhere in the U.S., allow for multiple hubs supporting a core, and so on.

Q. Could you share your thoughts on how hubs and NIST can work together?
A. Dr. Shenoy stated there is a lot of overlap in opportunities and that there is no duplication. The NSTC and the Commons will be working at readiness levels from 3 to 5. NSTC can work on the later levels of development.

Q. Clarification: Who has the final say on the hub's proposal inclusion?
A. Dr. Shenoy stated the hubs are a collection of organizations coming together, and they will have to be able to select the proposals internally and plan to support the network. We cannot have several projects from hubs; hubs will have to submit the projects between themselves.

Q. Who selects the hubs?

A. Dr. Shenoy responded that a source selection team selects the hubs.

Q. Do you see a need to enhance the needs of facilities and universities beyond what has been supported by NSF to create a more integrated fab demonstration at NSTC?
A. Dr. Shenoy stated the short answer is yes; it is a complex effort. There may be a need to set up infrastructure in the labs before transitioning to a lab. We want to promote prototyping, but the labs need to have the infrastructure to support the hub.

The meeting took a short break.

XI. Public Comment Period

Mr. Davis began discussing the public comment period. He stated that a FAQ document consisting of responses to the most common questions received would be posted on CHIPS.gov.

XII. Discussion and Deliberation

Mr. Davis then turned the meeting over to Mr. Splinter to discuss and deliberate on the information and presentations from the meeting. Mr. Splinter stated that there may be questions and answers in the future. He stated he was thinking about multiple discussions on the workforce today, including discussions about how much of the talent is U.S. trained and how to continue to bring the best and brightest around the world to the United States. Mr. Splinter stated every group is working on the workforce, and that this is an important aspect to include.

A Committee member stated the presentations made were amazing and wanted to commend the Committee included in this discussion. The Committee member stated the Department of Commerce brought in so many of the top talents, which was fantastic. One question was raised about the workforce: NSF had a direct impact. Everyone else is trying to make an impact but should there be a more systematic approach for the NSTC workforce group? Mr. Splinter replied that yes, this would fall under the purview of Dr. King Liu's working group. Mr. Splinter asked Dr. King Liu to take a deeper dive into this matter, to reinvigorate students, but also change the way it has been done in the past. Another Committee member commented that talented people are not moving into the U.S. and that money cannot be the only motivation to create engagement with semiconductors.

Another Committee member commented on the Secretary's comments on the workforce and stated it is reassuring that so many representatives agree with this emphasis on workforce training. Also, acknowledging the supply chain issues and that there are two sides to the workforce training. The Committee member added that students need to know they have an exciting industry waiting for them. NSTC should build this knowledge for students to become involved in the future.

Another Committee member mentioned the urgency of our efforts and stated we need to have a strawman structure and an early set of recommendations. The Committee member stated there is a real sense of urgency and we need to meet these deadlines. Mr. Splinter stated time is of the essence. The amount of work will be more manageable as time moves forward, but the front end is the tough part.

A Committee member made an observation, stating microelectronics presentations were excellent and made the straight call out to the stakeholders to startups being vital to the ecosystems. The Committee member stated that while they advised these stakeholders, the Committee needs to be very clear on who the customer is. This effort, the CHIPS Act, is the most important startup in the country, and we need to be clear on who the customer is and what problem we are solving for them. The Committee member stated we need to make some hard tradeoffs. NSF was good at calling out the successes it has had with CHIPS. Every single one of the big companies they mentioned was helped and supported by the government. If we don't push this innovation, we would not have succeeded. Mr. Splinter asked, what are our success factors? He stated the success factors are something we need to consider for the future.

Another Committee member commented that two important factors, effectiveness, and scale, have not been addressed yet. The meeting included a lot of valuable information on workforce development, but how do you put the elements of training together and make them effective? If the Committee and stakeholders don't put the same emphasis on workforce development that they have on R&D, then the metrics must be important as well as the return on our investment. A third component, scale, involves asking how much we can get with existing funds, how much from academia, and federal and state government involvement. Mr. Splinter added that they need to think about this broadly and systematically, including multiple levels of government.

A Committee member asked, if NIST can communicate in what format you want these recommendations to be submitted?

Mr. Boehm responded that the working group outputs could be a PowerPoint presentation to the Committee, or a letter report. A short white paper, maybe two or three pages, with a full report and presentation.

A Committee member commented that today was a great day of sharing. They asked, "If we could think about the year 2025, what is the number of chips that must be made to be competitive, and how many workers would be required to make that number possible?" They need to focus on that, or it will be lost regionally. Mr. Splinter added that they need to understand the demand side of this. He asked Dr. King Liu; how many factories and workers currently exist. Dr. King Liu replied that she only has some rough estimates, but tens of thousands of technicians and engineers over the next five years. A Committee member commented that there needs to be a strong demand from K-12 and community colleges. Also, that issues such as improving STEM demand will not change overnight.

A Committee member asked if it would be possible for NSTC to have a more coherent vision for these programs. Does it make sense to have more transparent technologies?

Mr. Splinter responded that these programs create a very complex picture, and they will have to learn as much as they can.

A Committee member commented that they have focused more on the R&D element, but how will the R&D and manufacturing aspects of the CHIPS Act be connected? What's the systemic connection? How shall we develop that connection and provide more input? Mr. Splinter replied that this connection is a big part of the charter, and they need to get NSTC to bring those

recommendations. A Committee member commented that they know the cyclical demand in the industry and are hoping to go forward. How do we think beyond the next downturn? Mr. Splinter added that the CHIPS Act understands the downturn and that the downturn is when you want to invest and change the future.

A Committee member stated they found the presentations and meeting inspiring. Prototyping is an expensive affair and takes a lot of practice and alignment. When they talk about the NSTC, they need to establish and build this to be used for a long time and remain vital to the ecosystems. What kind of metrology and prototyping flows are required to keep it going? If the NSTC can establish this, then we can improve these capabilities and help people count on them.

A Committee member stated that the Committee is uniquely positioned to show the impact of fab jobs, but there is a strategic thread missing. The Committee member asked, what is the story we tell in February and March about why their proposals are best to go first?

Mr. Splinter responded that developing a strategic answer to this question is an excellent challenge for the working groups. Note: The IAC shall not participate in selecting recipients of federal financial assistance.

A Committee member thanked the Committee for the day but stated they did not hear enough about the inclusion of diverse and minority communities, looking to ensure their inclusion and economic benefit, which is something the Committee should look for. Another Committee member stated that research aspects were discussed and emphasized work on nanoscales and quantum research centers. The Committee member pointed out that, on the demand side, they need to not conflate the demand for products with the demand for prototyping and consider how to lower costs and make prototyping more available to smaller businesses.

A Committee member commented that one area missing is the startups. They stated that they need to see where these startups are not competing but working with each other in the marketplace. Mr. Splinter replied that this is a great opportunity for collaboration.

A Committee member made a final comment, highlighting the need to focus on the lab and the fab, not just lab to fab or fab to lab. They should keep in mind the need for jobs to get students into those fields and how to include small businesses. Mr. Splinter commented on the technical capabilities of the supply chain and stated he's not worried about equipment but is more worried about the upstream suppliers and whether they are developing at the level we need. This question may be a second phase of R&D discussions. Mr. Splinter again thanked everyone for the learning opportunity and for understanding the magnitude and complexity of the goal.

XIII. Closing Business

Mr. Davis turned over the meeting for final comments to Dr. Laurie Locascio, the Under Secretary of Commerce for Standards and Technology and Director of NIST. Dr. Locascio stated how truly important and critical this meeting was. She highlighted the intense interest in the work, stating that over a thousand people participated online and adding that the world and government are listening. Dr. Locascio asked, how do they inspire the next generation? How do they bring it back? How do they inspire the next big things? They need to hear the Committee's

input. They need to have coordination across various programs and R&D. How do we reach across agencies and nations? Dr. Locascio stated that they don't want competition between allies and like-minded companies. She thanked agency partners and various support staff and recognized their cooperation and coordination to bring all this together. She expressed gratitude to the Committee and its members.

Mr. Splinter then addressed the Committee, stating the meeting made a clearer understanding for all. Another meeting will be held in early February, depending on the status of the working groups, and recommendations for Congress. Mr. Splinter once more thanked the Committee for their participation and wished everyone happy holidays.

Mr. Davis stated all presentations will be on CHIPS.gov, and a meeting will be held in February.

Mr. Benjamin Davis adjourned the meeting at 3 pm ET.

Below are the questions and comments received from the general public in advance of this meeting.

Topic	Attendee Questions
Funding allocation	Will some portion of CHIPS R&D funding be available for targeted R&D proposals for advanced semi/device development, for example a type of program that DARPA or C5ISR or other defense agencies typically fund? Or is it dedicated to infrastructure/ecosystem development?
Funding allocation	Will funding be available to assist in infrastructure upgrades such as utilities (gas, water, electric), broadband internet, and site development that will be needed to support the attraction and growth of this industry in middle America?
Funding allocation	What are the key measures or rubric for grading the qualification of upstream suppliers (e.g., suppliers of critical components for wafer fab equipment)? or other background which would help inform decision-makers about a company's fit for funding? Does it benefit upstream suppliers to have sponsoring equipment suppliers and/or fabs who use the upstream components?
Funding allocation	Is there a comprehensive listing of open solicitations that is available on a central website (doesn't appear to be on the CHIPS and Science Act website https://science.house.gov/the-chips-and-science-act) or can be provided?
Funding allocation	I'm interested in funding opportunities for quantum AI security technology development for turning concepts to prototypes. How can industry cross the Valley of Death to Commercialization? Developing concepts/prototypes in this field is millions not $100k split between multiple partner companies paid at the end of the work. Current programs are cash flow and IP unfriendly to small start-ups.
Funding allocation	Has DOC/IAC made further determination as to the universe of up- and down-stream entities that would be eligible to apply for the competitive funding, and/or file for AMIC, beyond the language already present in the Act? If not, when may such further guidance be published? Thank you -
Funding allocation	1). My organization is very much interested in learning how to become eligible and participate in creating one of the at least 20 new technology hubs. What is the process and procedure in setting up a tech hub?
Funding allocation	2). What International will small/minority business enterprises have to participate in the procurement process with Semiconductor Microchips design, manufacturing and R&D companies?
International	Have the Committee assessed the length of time required to on/offshore replacement semiconductor production facilities; recognizing the vulnerability of single technical points of failure, in Taiwan, would future plans include collaboration with US allies/countries?
IP	Can you address how the IAC will interact with small, non-traditional fabless semiconductor and MEMs companies that have invented key enabling proprietary technology. In particular, how the IAC plans to safeguard their intellectual property (IP) rights when introducing them into government supported projects, especially when they are providing technology that meets new project requirements.

Oversight	Give the amount of funding provided in the CHIPS Act, how will awarding agencies and recipient organizations ensure that they are best equipped to makes sure oversight is not an oversight and that accountable and secure research security is in place. - Mike Shannon, IPTalons, Inc.
Private investment	Is there a mandate for $ invested by private market vs public government firms? For example China has a 5 to 1 mandate.
Workforce	Will there be training programs for women/minority businesses that will help get minorities into that job market? If so, what programs are available. I would like to be a CHIP trainer and job placement professional to help American Blacks and other minorities succeed in this new field.
Tech priority	How important will be to have a strong supply chain of silicon carbide abrasives for the future of silicon carbide wafers?
Tech priority	How does Commerce expect to implement the PCAST guidance for wearable biosensors and mitigating neuro-diseases?
Funding allocation	Which organizations would be best to submit proposals to for R&D focused semi-conductor projects?
Funding allocation	When do you anticipate the release of funding opportunities?
Funding allocation	What's the process envisioned for the Department of Commerce to receive proposals for the CHIPS Act's grant program.
Funding allocation	What is the process to determine if contractors to CHIP manufacturers qualify for government grants?
Funding allocation	What is available for small companies and when will BAAs be published?
Funding allocation	funding for assembly, packaging and testing of Silicon Photonics chips and Photonics Integrated Circuits
Funding allocation	As it relates to Tech Hubs, what is the status on appropriations and what will this process look like? Any understanding of timing? When should we expect rulemaking and an application portal? Your insight on chances of success/failure moving forward?
IAC membership	What is the logic behind the appointment of only 24 committee members representing every facet of the programs?
IAC membership	Since the IAC does not have any representatives from the US Defense Industry, how will the IAC ensure it meets the legislative requirement in the CHIPS Act to address both economic and national security needs for microelectronics?
IAC membership	How can small business leaders be part of the advisory committee?
	How will loans and loan guarantees be implemented in support of VC-backed startups with existing senior venture debt?
	How will funding be implemented to support work on AI on chip projects?
International	Given that the semiconductor industry is has always been a global industry, one thing I did not hear today was which of all of these working groups and committees will be addressing who all of these CHIPS Act-enabled entities will be addressing how what we do going forward to reinvigorate our infrastructure can align within this broader global supply chain and not try to

	interrupt and duplicate this supply chain on-shore?
International	Considering the recent changes to the supply chain in China, what is current road map to accommodate the US supply chain of manufacturing? Thanks,
International	Will the China guardrails apply to CHIPS Act applications for programs under FY21 NDAA Section 9906
International	What are the benefits to IAC meeting for residents of Middle East? Could we participate physically in any other decisions Making events? Please let me know
Non-profits	What role will nonprofits and anchor institutions in local communities play in the execution and implementation of the strategy provided here today?
On-shoring	Is there a specific person at NIST to contact about CHIPS on-shoring opportunities? Perhaps associated with U.S. national lab partners?
Operation	Has DOC established a formal timeline for implementation of the NSTC and NAPMP?
Operational model	What type of operational model do you think would be useful for the NSTC to best meet industry needs?
Operations needs	What kind of software solutions is the committee seeking for supporting the government's newer NIST standards and Zero Trust needs?
Small business	What options are there for small businesses involved in the semiconductor industry to participate in the CHIPS Act?
Small business	Innovation is the catalyst of economy. In the coming digital era, with view to the CHIPS Act., where and how do small firms, pushing extreme innovation, participate?
Small business	How will research and development for dual purpose and defense applications from small business be supported?
State commerce	How can state level departments of Commerce showcase sponsorship of their supported and desired projects and companies?
Tech priority	What are the committee views on supporting reshoring for high power Silicon device manufacturing for the military and the electric utility applications?
Tech priority	Can you describe the differences between CHIPS efforts in semiconductors and electronics packaging?
Workforce	Does workforce development fit in to near term planning?
Workforce	Since every working group and committee seems to be recognizing the critical need for developing the workforce across the ecosystem, I did not hear exactly how all of these currently separate efforts including this topic within their focus are planning to work between these many efforts as much as possible upfront rather than duplicating efforts and supplying parallel recommendations to be sorted out later. Is there a plan as to how this broad and deep 'workforce' issue can be coordinated across all of these efforts, which by definition is going to be among the most difficult task as well as the one that is going to take the longest to address in a sustainable manner?

Ecology	Why did the US gov support so many kinds of batteries when the sodium ion battery is clearly the best? It doesn't rely on retrieving precious minerals 230 feet below sea level, destroying marine life & habitat, nor does it require engaging in difficult geopolitical scenarios.
Funding allocation	What grants are currently available to nonprofits?
Funding allocation	For those proposals approved for an award, how soon will funds be available, accessible or distributed? And what will means or mechanism be for distribution of award funds: percentage up front, with stages for future distributions, or lump sum? Third party custodian-discretionary? Thank you
International	1.Any application procedures for oversea institutions get involved in the R&D program? 2.How the R&D program use the infrastructure and facility currently in operation.
General	What is the best method for a US-based semiconductor company to learn about and engage in funded CHIPS programs?
General	Export inputs in relations of services and merging markets
General	interdisciplinary science education seems low. i don't see how the NIST miracle will persist. standards need to explain why pi is in some many equations, what to do with eponym measurements from joules to newtons, radiation conversion charts key , dimensionless constants ? meaning of equations/ equalities, epigenetics usurps Darwin, Townes
General	What are some key takeaways/priorities the committee has from the request for comment period on the CHIPS Act?
Science	What is Landauer's Principle?
Science	Is Polysilicon production understood to be the foundational building block of Semiconductor Manufacturing?
Small business	Small business to develop supply chain for semiconductors in America - what are the steps the committee is taking?
Small business	I am a new entrepreneur who is looking forward to discuss about viable options for trading minerals.
Funding allocation	Just a general question about the funding outlook/status for the Science portion of the Act.
General	The Question is process protection rule in law benefit new Digital Economy in Treasury and Bank Industry example rule Bit Coin and Virtual Dollar the is SEC only regulation boot the is Global rule trade Bit Coin and Virtual Dollar the classic contract only solution.
General	Looking forward to learning more about the IAC!
General	Is there questioning allowed during virtual
General	Coming by letter of recommendation from the California 10th district Congressional office
General	Can ZRELLAB LTD submit a proposal to the IAC for the empty Industrial property here in Philadelphia PA?
General	Planning to watch online, not in-person, but the webpage did not give me an option to simply watch online.