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CHIPS AND SCIENCE IMPLEMENTATION AND OVERSIGHT

HEARING

BEFORE THE

COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION UNITED STATES SENATE

ONE HUNDRED EIGHTEENTH CONGRESS

FIRST SESSION

OCTOBER 4, 2023

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SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED EIGHTEENTH CONGRESS

FIRST SESSION

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CHIPS AND SCIENCE IMPLEMENTATION AND OVERSIGHT

WEDNESDAY, OCTOBER 4, 2023

U.S. SENATE,
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,
Washington, DC.

The Committee met, pursuant to notice, at 2:08 p.m., in room SR–253, Russell Senate Office Building, Hon. Maria Cantwell, Chairwoman of the Committee, presiding.

Present: Senators Cantwell [presiding], Klobuchar, Schatz, Markey, Peters, Baldwin, Tester, Sinema, Rosen, Luján, Hickenlooper, Welch, Cruz, Thune, Wicker, Fischer, Moran, Blackburn, Young, Budd, Schmitt, Vance, and Capito.

OPENING STATEMENT OF HON. MARIA CANTWELL, U.S. SENATOR FROM WASHINGTON

The CHAIR. Good afternoon. The Senate Commerce Committee, Commerce, Science, and Transportation Committee will come to order.

I thank my colleagues, who, many have been in this room for many hours already today, doing double duty today on both an Aviation Hearing, and now a very important conversation about the Implementation of the CHIPS and Science Act, which our committee played a very big role in. So needless to say, our committee has been working very diligently on a lot of transformational policy.

While we are waiting for our colleague here, I think I will thank Senator Wicker, again, for his work on the CHIPS and Science Act. I think people may not remember, but this committee, I don't know how many amendments we processed, I know it was in the hundreds, it might have been in the three-hundreds. But I definitely believe that that kind of regular order process was good for the institution, good for the debate about science.

And hopefully, people will continue, in today's hearing, to understand that, and understand much of the debate that maybe wasn't as clear, in a big public perspective, as it was to all of us who were working behind the scenes, daily, to try to figure this policy out.

OK, we will go ahead and get started, and then when my colleague gets here, hopefully, he will be here soon, we will let him make his opening statement.

But welcome, Secretary Raimondo; and Director "Panch", is it OK, "Panch", Panchanathan, thank you for being here with us today.

I also want to mention that apparently, there is a FEMA Emergency Alert Test that is going to happen today. So if everybody in the room gets a big alert message, that is what that is about, and not to be concerned about it, but that everybody knows that it is going to go off.

So a little more than a year ago, Congress passed the landmark CHIPS and Science Act, and it was a clear commitment to America's competitiveness and the idea that we need to innovate in the United States. And clearly, we were doing a lot in innovation. We were publishing a lot. But we needed to translate more, patent more, and really help our manufacturing base be competitive for the future.

The two witnesses before us today led on the delivery of those commitments and are here to tell us today about the substantial progress their agencies are making during the first year of the implementation of this Act.

We have already seen the CHIPS and Science Act spur more than $200 billion in private sector investment, from semiconductors across the country to other investments. And the Federal Government's role in this is so important because the commitment to the CHIPS Program Office within the Department of Congress is generating more than 500 statements of interest from companies looking at new projects and innovation.

So today, we will have a chance to ask the Secretary about those proposals, building resiliency and a long-lasting semiconductor ecosystem in the United States. Since we had a chance to discuss this earlier, I am pretty sure we are going to hear today about how we are never going to be in this problem again as it relates to Legacy chips, that we are going to have a good plan to help on a supply chain development for that, that our DoD stature is going to continue to be on the cutting edge of chips.

And I think you are going to tell us that the diversity of applications, the robustness of it means that the ecosystem that we are trying to restore and grow is alive and well.

We have also seen NSF begin to roll out innovation engines with more than 43 million going to planning grants to tap innovation across the country. I love that the Director, during our efforts, basically coined the phrase "Innovation Anywhere, Opportunity Everywhere," and I definitely think that is what we were looking for in this legislation, both in the spreading of the amount of EPSCoR funding, and in diversifying a workforce opportunity across the United States.

For example, in the State of Washington, a Spokane company won a Regional Innovation Engine Award to advance energy and decarbonization. We all know that innovation and expertise helps us generate jobs and tackle some of our most pressing problems. And we know that what we have to do on this committee, besides hearing from these witnesses today, is push our colleagues to fully fund the aspects of CHIPS and Science that were funded.

In fact, the Committee's two previous attempts at competitive bills fell short because the funding was not realized, one, because we faced an economic downturn, and then the other just in our first, very first effort on competitiveness also didn't make the mark from an appropriations perspective.

So we know that our foreign adversaries are not waiting. We know that our strategic competitors are also moving ahead, and we need to make this investment to what we would say, "derisk the supply chain", and make sure that we are innovating and translating our science faster.

As we look to the future we need to work together to ensure that the U.S. remains competitive in the global marketplace on other issues like artificial intelligence, 5G wireless systems, and quantum computing. And that will require the United States to do a couple of things: The ability of the U.S. to produce and produce chips to support this innovation. That is why the advancement and hearing where we are with the applications is so important.

Second, we need a resilient supply chain that can withstand disruptions like we saw in the past, either geopolitical tensions, natural disasters, global pandemics, whatever, we need a more dependent supply chain, and a workforce that is well skilled and technical to the types of technology that are being produced today.

I personally believe this is one of the biggest gaps left to be addressed in the CHIPS and Science Act. We have some money, both for semiconductor training and workforce advancements, and some on the science side through NSF, but a lot more needs to happen.

In the United States, the jobs of tomorrow are here today, but the skill level of the workforce to do them is not. And so the more that we can take advantage of the job creation that is happening by marrying that up, something the Secretary knows from her days as Governor, the more we can streamline that and marry that up together, the more this engine is going to rev and keep effecting the U.S. economy.

Today, U.S. manufacturers only 12 percent of the world's semiconductors compared to where we were in the 1990s at 30 percent. So the question really today is, are we seeing the right level of investment to make a return to the market share that we think is important? My guess is we are going to hear both from the private sector investment that has already been made and the robust response to the programs. We are going to hear that the investment wants to be in the United States.

So, I think we can't emphasize enough how important it was to bring this manufacturing back. Consumers saw car prices raise as much as 40 percent. Truck manufacturers, like PACCAR in my state, weren't able to get semiconductors, weren't, literally, able to ship product. Supply chain resiliency also created deadlocks for other industries, and impacted national security. So, I hope that we will all work together on better tools for the future. I will have some questions about that in the question-and-answer period.

But the semiconductor industry today is facing a gap of 67—I am sorry—67,000 people by 2030. That is just semiconductors. So I know we, in my state, as it relates just to STEM, have a gap of 60,000 workers across various sectors, not just semiconductors. So clearly, we need to make the investments in the scholarship programs and in the STEM Apprentices and Workforce for Tomorrow to realize all this investment that is now being made in the United States of America.

So welcome to our witnesses. I will turn it over to my colleague, Senator Cruz, for his opening statement.

STATEMENT OF HON. TED CRUZ,
U.S. SENATOR FROM TEXAS

Senator CRUZ. Thank you, Madam Chair, for calling this important hearing. And welcome Secretary Raimondo, Director Panchanathan, for both being here today.

Semiconductors drive our modern economy, from cell phones, and cars, to supercomputers, and medical devices. These integrated circuits have been integrated into our daily lives.

Before 2020, however, when we suddenly couldn't get enough of them, most of us probably didn't realize just how big a role these chips play. It became very quickly apparent that, in terms of economic and national security, just how dependent and vulnerable we are on semiconductors. Yes, we rely on these chips for consumer electronics and cars, but they are also in just about every——

[Interruption by emergency alert test.]

Senator WICKER. I think your time is up, Senator.

[Laughter.]

Senator CRUZ. We have an emergency in semiconductors.

[Laughter.]

Senator CRUZ. That is a first. I believe——

The CHAIR. We announced it before you got here. So sorry, we should have given you some indication about that.

Senator CRUZ. I think our first witness is a semiconductor. You are done?

[Interruption by emergency alert test resumes.]

Senator CRUZ. No.

[Laughter.]

Senator CRUZ. As I was saying, with great trepidation, I observed that just about every advanced weapon system in our Military relies on semiconductors, and most of them are not made in the United States. Recognizing this, there was a flurry of legislative activity to onshore and near-shore semiconductor manufacturing last Congress, culminating in the CHIPS and Science Act.

Parts of this law, like the FABS Act, which I co-sponsored and enthusiastically supported, provided tax credits to incentivize chip investments in the United States. The final bill, however, also included a whopping $52 billion in direct subsidies from taxpayers that, in my view, would predictably lead to government bureaucrats picking winners and losers. At worst, this kind of industrial policy can be rife with political interference and waste, and even at best, it is often done poorly and inefficiently.

That is why I ultimately voted against the bill, despite it containing a number of things I strongly support. We are already seeing a number of these concerns realized. When I speak to companies in Texas, many of them bemoan how the Biden Administration has imposed extraneous nonstatutory conditions on receipt of taxpayer support.

Commerce isn't just asking if you have got the best technology or the cheapest manufacturing process; instead, the bureaucrats want to know if you have proper plans to subsidize child care or to support affordable housing. Have you adequately engaged with labor unions? Are your suppliers sufficiently diverse? None of these topics are critical to the fundamental question of whether you can build the best chip at the lowest price.

Maybe these issues are relevant, but does anyone think that officials in Washington know better than the engineers and the investors behind these projects? Moreover, none of these strings were included in the law, but they have, nonetheless been attached, by the Biden Administration, to try to enact by regulations things that they don't have the votes to pass through Congress.

As many Commerce Committee Republicans noted in the letter that we sent to Secretary Raimondo in March, this attempt at backdoor progressive social policy will only serve to make domestic chip production more expensive, less competitive, and more reliant on taxpayer subsidies over private investment.

More recently, an area of major concern has been the onerous environmental requirements under NEPA, and the potential for this environmental process law to drive up compliance costs for manufacturers and significantly slow new construction. That is why Senator Mark Kelly and I led a bipartisan amendment to the National Defense Authorization Act to exclude from NEPA the overwhelming majority of chips-funded semiconductor projects.

Secretary Raimondo, I want to thank you for your support on that effort, and for explicitly endorsing our amendment during your House testimony last month. Secretary Raimondo, we have also had good conversations about the importance of a strong U.S. chip industry. We both want to see America's innovative capacity soar, and we agree that using these taxpayer funds, appropriately, is immensely challenging.

Fortunately, states like Texas are showing us a path forward here. Texas boasts an established ecosystem of innovators, world-class universities, low taxes, and a permissive regulatory environment that enables companies to grow and to thrive. As a result, we have already attracted $61 billion in private, new semiconductor investments, and created over 8,000 new jobs, making Texas the center of U.S. semiconductor manufacturing.

Texas has a storied history in the invention and production of semiconductors, and we are proud to help lead America's semiconductor renaissance. And I would encourage the Commerce Department to look to the model in Texas and see how to make this broader effort more successful.

Finally, it is worth noting that the other half of the CHIPS and Science's Act, Director Panchanathan, the NSF, does substantial work advancing basic science that helps expand our scientific knowledge, and that is important work, but I am deeply concerned over what appears to be the increasing politicization of NSF-funded science, and the feedback loop, and the scientific stagnation this is creating.

I am especially disturbed by recent reports that NSF has, to the tune of tens of millions of dollars, been funding projects on how to counter, "populist narratives" and so-called "mis- and disinformation", which seems like little more than funding the pseudoscience of censorship.

So I look forward to hearing from both our witnesses today on how they are implementing this very important law. The taxpayers have put a lot of skin in this game, and we all owe it to them to get it right.

The CHAIR. Thank you. We will start now with Secretary Raimondo. Welcome. I can't imagine what a busy time it is for you and the organization that is implementing this Act. We appreciate your time being here today.

STATEMENT OF HON. GINA M. RAIMONDO, SECRETARY, U.S. DEPARTMENT OF COMMERCE

Secretary RAIMONDO. It is my pleasure to be here today. Thank you, Chairwoman, and thank you, Ranking Member Cruz, and Members of the Committee; thank you for the opportunity to come talk to you about how we are implementing this historic legislation. And of course, I am so pleased to be here with "Panch", a fantastic NSF Director.

I do want to begin by taking just a second to share my condolences with Senator Feinstein's family. She was a pioneer and a role model for so many women like me. So I wanted to just take a second to say that.

Because of your hard work, in large part due to you, Chairwoman Cantwell, and bipartisan support of the Committee, the Commerce Department now has the honor, responsibility to invest $50 billion in our domestic semiconductor manufacturing and research and development. And I concur; this is an enormous responsibility and a massive amount of taxpayer dollars.

We opened the application process in February, just a few months after you passed the bill. We have since received more than 500 statements of interest from 42 states, from manufacturers large and small. They outline proposals to manufacture chips and the relevant equipment and materials here in the United States. Very importantly, of the 500 statements of interest, we have received over 100 applications, or pre-applications.

In the last two weeks, we finalized and put out the guardrails to protect U.S. Government investments and bolster our national security. We are also developing our CHIPS R&D Program to meet the unique challenges of building a sustained R&D to manufacturing pipeline. The centerpiece of these efforts is the National Semiconductor Technology Center, or the NSTC, which we expect to launch this fall. So a great deal of activity since about a year ago when the bill was passed. And of course, all of that research and development work we are doing in collaboration with the NSF.

The CHIPS and Science Act also authorized two new programs, the Tech Hub Initiative and Recompete, which we are administering through the EDA. We have received 400 applications for the Tech Hub grants. It is unbelievable; I have never seen anything more oversubscribed. Later this fall, EDA will launch—will make the announcements of the Tech Hub designations, and then also invite an opportunity for additional funding for implementation.

Similarly, we are investing $200 million in the Recompete Pilot Program to spur economic activity in geographically diverse and economically distressed communities across the country.

Thanks to your work in the CHIPS and Science Act, we are making historically bold and strategic investments that will strengthen our national and economic security. If we are successful, when we are successful, the United States will become the premier destination in the world where new chip architectures can be invented in

our research labs, designed for applications, manufactured at scale by well-trained, well-paid American workers, and packaged in the United States. So it is a tremendous piece of work that we have, great progress on since the bill was passed; of course, we will answer any questions related to that.

Before I close, just to mention how stressed we were about the possibility of a Government shutdown, and how troubling it was to come within hours of that shutdown. So thank you for working hard to make sure that did not happen. It goes without saying, China, Russia, Iran aren't shutting down. The work we are doing in the CHIPS Act is essential to our national security, and any shutdown would be massively disruptive to our ability to stay on the pace that we are on in implementing this very important work.

So with that, I will be open for questions, or turn it over to Panch.

[The prepared statement of Secretary Raimondo follows:]

PREPARED STATEMENT OF HON. GINA M. RAIMONDO, SECRETARY, U.S. DEPARTMENT OF COMMERCE

Chair Cantwell, Ranking Member Cruz, and members of the Committee, thank you for this opportunity to update you on the Commerce Department's (Commerce, or the Department) efforts to unleash the next generation of American innovation, protect our national security, and preserve our global economic competitiveness through implementation of the "CHIPS and Science Act", which Congress passed and President Biden signed into law over one year ago.

Thanks to the bipartisan support for the CHIPS and Science Act from members of this Committee and across the Congress, the Department is making substantial progress on some of our Nation's most pressing economic and national security priorities, including those related to our supply chains, manufacturing, innovation, and workforce.

The research, innovation, and manufacturing sparked by this law can solidify America's position as the world's technological superpower, securing our economic and national security future for the coming decades. As global competition becomes increasingly about technology and semiconductors (chips), rather than just tanks and missiles, the countries that invest in research, innovation, and their workforces will lead in the 21st century. The CHIPS and Science Act will help enable us to seize that leadership with its strong support for the National Institute of Standards and Technology (NIST) and its important mission focused on developing the measurement science and standards critical to U.S. leadership in emerging technologies like biotechnology, quantum science, cybersecurity, and artificial intelligence. Over the past year, NIST has made significant advances in each of the areas highlighted by the Act, including the release of the NIST Artificial Intelligence Risk Management Framework, the update of NIST's Cybersecurity Framework, funding for additional regional cybersecurity workforce partnerships, and enhanced leadership in international standards development through the launch and implementation of the United States Government National Standards Strategy for Critical and Emerging Technologies. Furthermore, I appreciate this Committee's support for strengthening and updating the research infrastructure at NIST and it continues to be a priority of the Department.

CHIPS Incentives and Research and Development (R&D) Implementation

Within the CHIPS and Science Act, the CHIPS program's success will be judged on at least two key criteria: one, whether this program enabled us to build a reliable and resilient semiconductor industry including a robust workforce and strong innovation ecosystem that protects America's technological leadership for the coming decades; and two, whether the Department was a good steward of taxpayer dollars. The United States government is making a public investment in private industry without recent precedent, and taxpayers deserve transparency and accountability.

Today, I would like to provide the Committee with an update on the Commerce Department's efforts toward implementing this historic legislation. The National Institute of Standards and Technology at the Department of Commerce is overseeing $50 billion to revitalize the U.S. semiconductor industry, including $39 billion in semiconductor incentives and $11 billion in research and development. Since August

2022, when the CHIPS and Science Act became law, the Department has created and staffed two new offices, the CHIPS Program Office (CPO) and the CHIPS R&D office, hiring over 150 employees to develop, implement, and oversee the programs. Both offices have attracted top-notch talent across sectors, including from private industry, national security, finance, and the Federal government.

In February, the Department launched the first funding opportunity, seeking applications for projects to construct, expand, or modernize commercial facilities for the production of leading-edge, current-generation, and mature-node semiconductors. This includes both front-end wafer fabrication and back-end packaging. In June, the Department opened this funding opportunity to semiconductor materials and manufacturing equipment facilities for which the capital investment equals or exceeds $300 million. Last week, the Department released a second funding opportunity which seeks applications for smaller-scale projects involving the construction, expansion, or modernization of semiconductor materials and manufacturing equipment facilities for which the capital investment falls below $300 million. In the coming months, the Department intends to announce an additional funding opportunity for R&D facilities.

Across all of the funding opportunities, applicants will be evaluated based primarily on the extent to which the application addresses the program's economic and national security objectives, but they will be based on commercial viability, financial strength, project technical feasibility and readiness, workforce development, and broader impacts, like the ability of the new facilities to support the R&D programs like the National Semiconductor Technology Center (NSTC).

To guide its investments, the Department has released two "Vision for Success" papers outlining its strategic objectives. The first vision statement focused on the Department's investments in commercial fabrication facilities. If those investments are successful, then by the end of the decade the United States will have at least two new large-scale clusters of leading-edge logic fabs; be home to multiple high-volume advanced packaging facilities; produce high-volume leading-edge dynamic random-access memory (DRAM) chips on economically competitive terms; and have increased production capacity for the current-generation and mature-node chips most vital to U.S. economic and national security.

The Department has also released a vision statement for its investments in facilities for semiconductor materials and manufacturing equipment. In investing in the upstream supply chain, the Department aims to strengthen supply chain resilience, including by addressing chokepoint risks flowing from geographic concentration; advancing U.S. technology leadership; and supporting vibrant U.S. fab clusters.

Since the launch of the first funding opportunity, the response has been overwhelmingly positive—the Department has received more than 500 statements of interest (SOIs) from companies in 42 states. These SOIs represent potential applicants seeking CHIPS incentives for commercial fabrication facilities, packaging facilities, material suppliers and equipment manufacturers, and R&D facilities. Additionally, the Department has received over 100 pre-applications and full applications, demonstrating that as applicants become eligible to file a pre-application or full application, they are moving through the process and directly engaging with the CHIPS Incentives Program. It is clear that the private sector is eager to continue investing in America and is ambitious about scaling up semiconductor production across the country.

In addition, recognizing the national security imperative of investments in the domestic semiconductor industry, the Departments of Commerce and Defense in July announced a Memorandum of Agreement (MOA) to expand collaboration to strengthen the U.S. semiconductor defense industrial base. The agreement will increase information-sharing between the Departments to facilitate close coordination on the CHIPS for America's incentives programs, including collaboration on potential investment applications to ensure that our departments are making complementary decisions that maximize Federal investments under the CHIPS Incentive Program and the Department of Defense's (DoD) Defense Production Act and Industrial Base Analysis and Sustainment funds. This alignment of priorities and decision-making will help ensure that our respective investments position the U.S. to produce semiconductor chips essential to national security and defense programs.

The Department's commitment to national security in the CHIPS program is also reflected in our effort to implement strict guardrails to ensure that the investments made in research and innovation are not used to benefit foreign countries of concern, which includes China. Last month, the Department issued a final rule that meets the national security goals of the CHIPS and Science Act. The rule, "Preventing the Improper Use of CHIPS Act Funding," seeks to impose two main categories of guardrails: 1) limiting the expansion of semiconductor manufacturing in foreign countries of concern, and 2) limiting joint research or technology licensing

efforts with foreign entities of concern that relate to technology or products that raise national security concerns. The rule will help ensure CHIPS investments enhance global supply chain resilience and promote U.S. leadership in designing and building important semiconductor technologies.

Our CHIPS projects cannot succeed without investing in the workers who will build, operate, and maintain fabs. Last February, I called for America to double the semiconductor workforce overall including by tripling the number of graduates in semiconductor related fields and training 100,000 new technicians. Since then, the Department has worked closely with the semiconductor industry, labor unions, education providers, and other community partners to develop a strong vision for workforce development. This includes carefully assessing the workforce development plans in applications, working with recipients and education and training partners once awards are made, and supporting investments that expand the workforce pipeline including women and people of color.

Finally, the CHIPS and Science Act also created a 25 percent investment tax credit for companies making qualified investments in facilities with a primary purpose of producing semiconductors or semiconductor manufacturing equipment. We welcome the Department of the Treasury's work to implement this tax credit, including the release of a proposed rule in March 2023. This tax credit will be an important complement to Commerce's incentive funds.

Our success will be short-lived if we focus only on manufacturing. The $39 billion in incentives will bring semiconductor manufacturing back to the United States, but a robust R&D ecosystem will keep it here. That is why, with the support of Congress, the Department is investing $11 billion to build a strong semiconductor R&D ecosystem to generate the ideas and the talent necessary to support these efforts.

The heart of these investments is the National Semiconductor Technology Center, which is an ambitious public-private partnership where government, industry, customers, suppliers, educational institutions, entrepreneurs, and investors converge to innovate, connect, and solve problems. The Department envisions a network of several centers around the country, solving the most impactful, relevant, and universal R&D challenges in the industry. Their work—fueled by industry support—will generate new devices, processes, tools, and materials for our manufacturing ecosystem. Most importantly, the NSTC will ensure that the United States leads the way in the next generation of semiconductor technologies—everything from quantum computing, materials science, and Artificial Intelligence (AI) to future applications not even contemplated yet.

Recently, the Department announced leaders to serve on a selection committee that, acting independently of the Department, will select the board of trustees that will form a non-profit, which the Department anticipates will serve as the operator for the NSTC. I am pleased to inform the Committee that, together with our partners at DoD, the Department of Energy, and the National Science Foundation, the Department of Commerce is in the process of establishing the NSTC consortium. The Department anticipates that the NSTC consortium will be operated by the new, purpose-built, non-profit entity.

In addition to the NSTC, the Department received funding for three programs that are also focused on research and development—the National Advanced Packaging Manufacturing Program, the CHIPS R&D Metrology Program, and the Manufacturing USA institute(s). We anticipate that the four R&D programs will share infrastructure, participants, and projects and operate in coordination with each other. The CHIPS R&D programs will be informed by the needs of the entire American semiconductor ecosystem including the recipients of CHIPS manufacturing incentives. In turn, the technological and workforce advancements made by CHIPS R&D programs will benefit the U.S. semiconductor sector and supply chain—and help incentivize recipients and others to overcome manufacturing hurdles, compete in global markets, and meet the goals of the CHIPS and Science Act. We will continue to work with partners across the interagency including the National Science Foundation, which oversees $200 million for CHIPS workforce, the DoD, Department of Energy, and others to achieve these goals.

Instead of aiming for self-sufficiency or looking to close the United States off from global markets or competition, the Department is working to strengthen our position as a global leader in a fiercely competitive and global industry. As CHIPS for America invests across the supply chain, the Department is prioritizing robust international engagement. Through bilateral and multilateral dialogues, and business-to-business and government-to-business forums, the Department is working with like-minded partners to strengthen and diversify the global semiconductor supply chain. The Department's CHIPS-related international engagement to date has included engagements with the Republic of Korea, Japan, India, and the United Kingdom, and through the Indo-Pacific Economic Framework (IPEF), the U.S.-European Union

Trade and Technology Council (TTC), and North American Leaders' Summit (NALS). The Department will continue coordinating closely with U.S. partners and allies to advance these shared goals, advance our collective security, and strengthen global supply chains.

We also welcome the work of the Department of State in implementing the International Technology Security and Innovation Fund ("ITSI Fund"), which was created under the CHIPS and Science Act and provides the Department of State with $500 million overall—to deepen U.S. cooperation with like-minded countries, on both semiconductor and secure Information and Communications Technology lines of effort, to ensure that the technologies of the future will reinforce our shared economic and national security. The Department applauds the State Department's announcement in June that it is directing funds from the ITSI Fund to support projects this year and next year at the Organisation for Economic Co-operation and Development (OECD) to create an information exchange network of officials involved in semiconductor industry policymaking, a government-to-government repository of information on active and planned semiconductor production facilities, and other efforts to work collaboratively to develop strategies that increase the resilience of global semiconductor supply chains.

Regional Technology and Innovation Hubs (Tech Hubs) Implementation

In addition to revitalizing America's domestic semiconductor manufacturing sector and research and development ecosystem, the CHIPS and Science Act enabled the development of centers of innovation and job creation through the Regional Technology and Innovation Hub Program (Tech Hubs), administered by the Economic Development Administration (EDA). The Tech Hubs program aims to strengthen economic and national security by enabling the industries of the future to start, grow, and remain in regions throughout the United States. In these Hubs, institutions of higher education, state and local governments, economic development organizations, labor and workforce partners, and others in the region will come together to supercharge ecosystems of innovation for technologies that are essential to our economic and national security.

In May, the Department launched the first Notice of Funding Opportunity (NOFO) to open applications for strategy development funding and Tech Hubs Designations. Later this year, the Department will launch a second NOFO for applicants designated as a Tech Hub to apply for implementation funding. Through these two phases, EDA will award $500 million appropriated through the Consolidated Appropriations Act, 2023. Successful proposals will demonstrate a region's commitment to its primary technological strength and the potential for Tech Hubs investments to enable the region's primary innovative industry to become a global leader in that critical technology area within a decade. EDA received 378 applications in response to the first NOFO by the August 15 deadline. Each applicant selected their region's core technology industry that fits among 10 Key Focus Areas (*e.g.,* AI, high-performance computing, quantum information science and technology, robotics, etc.) identified in the CHIPS and Science Act.

Through the Tech Hubs program, the Department is committed to strengthening economic and national security by advancing the capacities of regions to manufacture, commercialize, and deploy these technologies, guided by the following priorities: 1) making more U.S. regions strong competitors in the global innovation economy; 2) building strong communities that share in the prosperity technological innovations bring; 3) spurring the creation of new good jobs and other opportunities for workers at all skill levels; and 4) strengthening and making more resilient the supply chains that our innovative technology-centric industries rely on to stay secure and competitive.

Distressed Area Recompete Pilot Program (Recompete) Implementation

As part of the Department's commitment to creating good-paying jobs and ensuring that no community is left behind, another key element of the CHIPS and Science Act is the Distressed Area Recompete Pilot Program (Recompete). In June of this year, Commerce announced that Recompete will invest $200 million in projects that spur economic activity in geographically diverse and persistently distressed communities across the country. Specifically, this program targets areas where prime-age (25–54 years) employment significantly trails the national average. The program aims to close this gap through EDA's place-based approach and delivering large, highly flexible grants based on community-driven strategies to address unique workforce and economic development needs of individual communities or regions.

The Department is running Recompete through two phases. As part of our June announcement, the Department launched the first phase, a Notice of Funding Op-

portunity (NOFO), which invites applicants to apply for (1) Strategy Development Grants, (2) approval of a Recompete Plan, or (3) both. In Phase 2, regions with approved Recompete Plans will be invited to apply for implementation funding. EDA anticipates making 4–8 implementation awards between $20 million and $50 million, each. Eligible applicants include local and state governments, Tribal governments, political subdivisions of a State or other entity, non-profits, Economic Development Districts, and coalitions of any of these entities that serve or are contained within an eligible geographic area. To support applicants in determining if they are in an Eligible Area, EDA, in partnership with Argonne National Laboratory, has released the Recompete Eligibility Mapping Tool. Announcement of Phase 1 winners and the release of the Phase 2 NOFO is expected later this year, and applicants with approved Recompete Plans will be invited to submit a Phase 2 application. Working with our state and local partners, Recompete will target areas of our country most in need of economic resources, assets, and options to ensure that they get the investments they deserve.

NIST for the Future Implementation

The Department appreciates the reauthorization of NIST through the inclusion of Title II of Division B, commonly known as the "NIST for the Future Act", in the CHIPS and Science Act of 2022. NIST is essential in the development, manufacture, and adoption of technologies critical today and those yet to be imagined, enabling both economic and national security for the Nation. NIST's mission focuses on driving U.S. innovation and supporting U.S. businesses and U.S. economic security in Critical and Emerging Technologies (CETs), including artificial intelligence, quantum information technologies, biotechnology, communication, and networking technologies. In addition to NIST's ongoing research role with CETs, NIST is leading the execution of the U.S. Government's National Standards Strategy for Critical and Emerging Technology and the development of Federal standards policy to ensure continued U.S. global economic competitiveness and technology leadership. I would also like to highlight that NIST's laboratory and extramural programs, such as the Manufacturing Extension Partnership (MEP) and Manufacturing USA, help U.S. industry develop and implement new technologies, develop robust supply chains, refine their systems for efficiency and effectiveness, and increase engagement of underserved communities in workforce development programs.

The CHIPS and Science Act authorized a pilot program of awards that will allow MEP centers to provide services focused on resiliency of domestic supply chains, workforce development, and adoption of advanced technology upgrades at small and medium-sized manufacturers. In June, we awarded roughly $400,000 to MEP Centers in every state and Puerto Rico. The more than $20 million in funding is being used to develop programs to make domestic supply chains more resilient and efficient. The new awards will focus on providing supplier scouting services, establishing new service offerings to improve existing supply chain networks, filling gaps in the supply chain by connecting original equipment manufacturers with small and medium-sized manufacturers, and creating a complete map of U.S. supplier capability and capacity.

Manufacturing USA will announce a funding opportunity in the fall for a new Commerce-sponsored Manufacturing USA institute. Manufacturing USA was appropriated $14 million in one-time supplemental funds in support of CHIPS and Science Act responsibilities. The Workforce, Education and Vibrant Ecosystems (WEAVE) funding opportunity was announced in August and will be open to existing Manufacturing USA institutes. These will be public service awards to engage with HBCUs and minority-serving Institutions and to assist in transitioning Institute-developed technologies into the public, such as through testbeds and other types of technologies that can address scale up.

NOAA Ocean Acidification Activities

The CHIPS and Science Act strengthens the National Oceanic and Atmospheric Administration's (NOAA) mission of science, service, and stewardship. NOAA is building a climate resilient nation by expanding NOAA's authoritative climate products and services in coordination with its Federal partners; fostering environmental stewardship and optimizing advances in science and technology to create value-added, data-driven economic development; and improving capabilities and knowledge sharing, expanding opportunities, and honing service delivery.

Reauthorized and expanded by the CHIPS and Science Act, NOAA's Ocean Acidification Program coordinates research, monitoring, and activities to understand where and how fast the ocean's chemistry is changing, as well as the impacts these changes have on marine life, people, and economies. NOAA is working with other

agencies and partners on these efforts, including in the stewardship of data necessary to make decisions to mitigate and adapt to the impacts of ocean acidification.

Public Wireless Supply Chain Innovation Fund Implementation

The CHIPS and Science Act also funded the Public Wireless Supply Chain Innovation Fund. The $1.5 billion Innovation Fund supports the development of open and interoperable wireless networks. This grant program will help drive wireless innovation, foster competition, and strengthen supply chain resilience. It will also help unlock opportunities for innovation and competition in a market historically dominated by a few suppliers, including high-risk suppliers that raise security concerns.

In April, the Department announced its first funding opportunity under the Innovation Fund, making $140.5 million available to demonstrate the viability of new approaches to wireless, such as open radio access networks (Open RAN). The Department received more than 120 applications for the first round of funding. And in early August, the Department announced nearly $5.5 million in awards from the first round of grants, which will support R&D and testing activities related to energy efficiency, the performance of interoperable equipment, and spectrum sharing testing. These are just the first steps the Department will take to promote the development and adoption of open, interoperable, and standards-based networks, and the Department will continue to make awards under the first funding opportunity through the fall.

A Strong Position to Lead Globally

The CHIPS and Science Act is central to the Biden Administration's efforts to revitalize American manufacturing and innovation and to lead globally. To effectively lead globally, the United States needs bold domestic investments and innovation ecosystems that bring manufacturing in critical technologies and industries back home. Moreover, without manufacturing strength in the United States and the innovation that flows from it, we risk again experiencing the devastating impact of supply chain shortages that we did during the height of the COVID–19 pandemic.

Over one year removed from the enactment of the CHIPS and Science Act, the Commerce Department's bold, strategic, and targeted investments are bolstering our economic and national security, making our semiconductor supply chain more resilient, promoting American manufacturing and innovation, and helping more workers and businesses compete and win in the 21st century global economy. The investments in critical technologies and regions unleashed by this law are essential to maintaining American technological leadership in the world in the 21st century global economy.

This testimony captures only some of the Department's activities to date under the CHIPS and Science Act. While the Department has made significant progress in implementation, more work remains to realize the promise of this historic law, and Congress is an important partner in these efforts. Thank you for the opportunity to testify, and I welcome your questions.

The CHAIR. Thank you.

Director Panchanathan, thank you for being here.

STATEMENT OF DR. SETHURAMAN PANCHANATHAN, DIRECTOR, NATIONAL SCIENCE FOUNDATION

Dr. PANCHANATHAN. Thank you so much. Thanks Chair Cantwell, Ranking Member Cruz, and Members of the Commerce Committee. It is great to be with all of you today, particularly with a colleague and a friend, Secretary Raimondo.

Before I begin, I would like to extend my deepest condolences to all of you for the loss of your colleague, Senator Diane Feinstein. Not only was Senator Feinstein an incredible leader and trailblazer, she was also a champion for science, and NSF is grateful for her service to the Nation.

Thank you for the opportunity to discuss the National Science Foundation's implementation of the CHIPS and Science Act, and how the agency is building upon decades of successful investments in science, engineering, and technology to ensure that the United States remains the global leader in innovation.

For more than seven decades, NSF has been critical to powering our economy, transforming our quality of life, and securing our national defense, and yes, the Nobel Prizes yesterday, and today, and more to come. Many of the technological advances benefiting the Nation today, such as artificial intelligence, quantum information science, and biotechnology, are rooted in sustained NSF investments over many decades.

However, we currently face intense global competition in the race to develop these technologies and to train the workforce of the future. NSF's ability to enable scientific breakthroughs and accelerate technological developments is central to our economic and national security and our continued global leadership.

With the passage of the CHIPS and Science Act of 2022, Congress put in place a roadmap for meeting this challenge while spurring innovation in communities across our country. Over the past year and with the increased appropriations in Fiscal Year 2023, NSF has been able to make significant progress in implementing the CHIPS and Science Act. The agency has moved quickly to launch new opportunities for innovation, implement research security measures for safeguarding taxpayers' investments, and engage talent to inspire the STEM leaders of tomorrow.

The NSF Regional Innovation Engines will catalyze new businesses and economic growth in diverse regions of America. When the NSF Engines' Program released its first funding opportunity last year, we received nearly 700 concept papers from every state and U.S. territory of our Nation.

In May, NSF announced the first-ever NSF Engine Development Awards, consisting of 44 unique teams spanning 46 states and U.S. territories. Then, in August, NSF announced 16 finalists for the first full-scale NSF Engines. Through these two tracks, NSF plans to have invested nearly $200 million in regional innovation throughout our country by the end of this calendar year.

I cannot understate how critical it is that we engage every part of our Nation in these efforts. NSF has been intentional in implementing new opportunities and expanding existing initiatives to engage everyone who wants to participate in STEM, in every state, across every geographic boundary, drawing the full diversity of our Nation. The CHIPS and Science Act included a requirement that NSF grow its investment in EPSCoR jurisdictions over time.

I am very pleased to report that NSF has met and even exceeded the EPSCoR targets in the CHIPS and Science Act of Fiscal Year 2023.

It is also critical that we safeguard these investments and take steps to address research security while also cultivating vibrant international partnerships. NSF plays a leading role in Federal efforts to address research security, and we are expanding the agency's capabilities and competencies to protect taxpayer investments.

The CHIPS and Science Act includes valuable provisions that will help NSF build the capacity of the research community to make risk-informed decisions and strengthen the security of our national research enterprise.

Equally important to the Nation's competitiveness, is NSF's commitment to funding exploratory-based research that creates new knowledge, and seeds the industries of tomorrow.

For example, many of the AI advancements making news today, we celebrate them, both the innovative products and the talent that is developing them were catalyzed by NSF's continued investments over many decades, even through AI winters.

Likewise, the technological advancements of tomorrow will be borne out of today's investments. In just the past 3 years, NSF has established 25 National AI Research Institutes in partnership with Federal agencies and industry. The half-a-billion-dollar investment reaches almost into every state, supporting cutting-edge research that is applying AI to key economic sectors like agriculture, weather, and public health.

NSF's ability to generate more breakthroughs and foster more innovations, and to do so faster than ever before, is critical to keeping our country as a global leader in STEM. With the support of this Committee, and Congress, and through continued successful implementation of the CHIPS and Science Act, NSF is strengthening our national and economic security and enabling, to quote again Chair Cantwell, "Innovation anywhere and opportunities everywhere across our nation".

Thank you for the opportunity to testify before you today.

[The prepared statement of Dr. Panchanathan follows:]

PREPARED STATEMENT OF DR. SETHURAMAN PANCHANATHAN, DIRECTOR, NATIONAL SCIENCE FOUNDATION

Introduction

Chair Cantwell, Ranking Member Cruz, and Members of the Committee, it is a privilege to appear before you today to discuss the National Science Foundation's implementation of the CHIPS and Science Act of 2022, and how the agency is building upon decades of successful investments in science, engineering, and technology to ensure that the United States remains the global leader in innovation into the future.

Established by the National Science Foundation Act of 1950 (P.L. 81–507), the National Science Foundation (NSF) is an independent Federal agency charged with the mission "to promote the progress of science; to advance the national health, prosperity, and welfare; to secure the national defense; and for other purposes." NSF is unique in carrying out its mission by supporting research across all fields of science, technology, engineering, and mathematics (STEM), and at all levels and settings of STEM education. NSF investments contribute significantly to the economic and national security interests of the Nation, and the development of a future-focused science and engineering workforce that draws on the talents of all Americans.

For more than seven decades, NSF has been a critical component in powering the United States economy, transforming American lives, and securing the national defense. Many of the technological advances from which the Nation is benefiting from today, such as Artificial Intelligence (AI), Quantum Information Science, and Biotechnology, are rooted in sustained NSF investments. However, we currently face intense global competition in the race to develop the next breakthroughs in these key technology areas and to grow the workforce needed to unlock these innovations. Our success in enabling scientific breakthroughs and accelerating these and other technological developments is central to our economic and national security and our continued global leadership.

With the passage of the CHIPS and Science Act of 2022, Congress put in place a roadmap for meeting this challenge while also spurring innovation in all communities throughout the country. The law codifies NSF's new Directorate for Technology, Innovation, and Partnerships (TIP), and positions the agency to capitalize on the uniquely American research and innovation ecosystem that includes academia, private industry, the government, civil society, and other partners to shape future research directions and quickly translate research outputs into impacts that benefit the Nation. The law also reaffirms our commitment to exploratory-based, discovery-driven research that is foundational to advancing progress. NSF is unique in how the agency invests in research across every STEM discipline, and the CHIPS

and Science Act challenges us to invest even more intentionally across all geographic boundaries and socioeconomic groups. Through such investments, NSF plays a major role in inspiring and training the next-generation STEM workforce—through K–12 informal STEM education, technical training, support for master's and Ph.D. students, and adult and continuing education, including experiential learning, enabling reskilling and upskilling of the current workforce. NSF's role in workforce training has become increasingly important with the significant investments in semiconductor manufacturing, which will require strong partnerships between the Federal government, academia, and private industry to train the needed workforce. The CHIPS and Science Act provided $200 million for the CHIPS for America Workforce and Education Fund, and NSF is using the $50 million provided over Fiscal Years 2023 and 2024 to leverage additional resources, including more than $145 million in partnerships with the private sector, to address the needs of the semiconductor industry.

Over the past year, with the increased funding the agency received in the FY 2023 Omnibus Appropriations Act, NSF has been able to make significant progress in implementing the CHIPS and Science Act. The agency has moved quickly to expand the TIP Directorate by launching new opportunities for innovation while engaging industry, academia, philanthropies, and others to ensure the broadest possible impact of these critical investments. The agency has also moved swiftly to implement research security measures to safeguard taxpayer investments and has conducted outreach, education, and training throughout the research enterprise while strengthening agency oversight measures. In addition, NSF continues to prioritize engaging talent and inspiring the STEM leaders of the future throughout the Nation—from all geographic and demographic backgrounds—to ensure we are training the domestic workforce needed for our future competitiveness.

Ensuring U.S. Leadership in Innovation

With the support of the Administration and Congress, NSF launched its first new directorate in more than thirty years. The new Directorate for Technology, Innovation, and Partnerships (TIP), which was codified in the CHIPS and Science Act, sits at the crossroads of exploratory, curiosity-driven research, use-inspired, solutions-oriented research, and translational research across all disciplines of science and engineering. The TIP Directorate, in close collaboration with all of NSF's directorates and offices, is focused on advancing the key technology areas and addressing the national, societal, and geostrategic challenges identified in Section 10387 of the CHIPS and Science Act. TIP is fostering new innovation ecosystems throughout the Nation, transforming regions into national and global anchors in key technologies; accelerating the translation of research results from the lab to the market and society; and cultivating new education pathways for a diverse and skilled future technical workforce comprising researchers, practitioners, technicians, entrepreneurs, and educators. Further, TIP opens new possibilities for research, innovation, and education by catalyzing strategic partnerships linking academia; industry, startups and small businesses; federal, state, local, and tribal governments; nonprofits and philanthropic organizations; civil society; and communities of practice to cultivate 21st-century innovation ecosystems that give rise to future, high-wage, good-quality jobs and enhance the Nation's long-term competitiveness. Over the past year we have seen immense interest from a wide range of institutions, industries, and state and local governments in the new opportunities NSF has unveiled through TIP. For example, nearly 700 teams from every state and U.S. territory responded to the NSF Regional Innovation Engines call for concept papers.

Since the enactment of the CHIPS and Science Act just over a year ago, NSF has moved expeditiously to realize the law's vision for TIP. In that time, NSF has made more than 760 new awards and partnered with 10 different Federal agencies and more than 10 industry groups or nonprofits through the TIP Directorate. These efforts span a wide range of activities, ranging from regional innovation to supporting the next generation of entrepreneurs.

As authorized by the CHIPS and Science Act, the NSF Regional Innovation Engines (NSF Engines) program is a major new undertaking that will catalyze new businesses and economic growth in diverse regions of America that have not fully participated in the technology boom of the past several decades. Understanding that not all communities and proposed collaborations will be immediately ready to launch full-scale NSF Engines, the program comprises two tracks: Type-1 NSF Engines Developmental Awards and Type-2 NSF Engines. The Type-1 awards invest up to $1 million to help organizations create connections and develop their local innovation ecosystems over a two-year period to prepare strong proposals for becoming future NSF Engines. The Type-2 NSF Engines could receive up to $160 million over 10 years. When successful, an NSF Engine will lead to its region becoming a nation-

ally and potentially globally renowned, self-sustaining, technology and innovation-driven hub of economic activity for the topic in which it specializes. Each NSF Engine's status and overall progress will be assessed annually, with metrics and milestones that will determine whether NSF will continue to support the NSF Engine year over year. Through these two tracks, NSF is seeding the future for communities to grow their regional economies by fostering partnerships that will unleash ideas, talent, pathways, and resources to create vibrant innovation ecosystems across the United States.

When the NSF Engines program released its first funding opportunity, NSF received nearly 700 concept papers from every state and U.S. territory. In May of this year, NSF announced the first-ever Type-1 NSF Engines Developmental Awards consisting of 44 unique teams spanning 46 states and U.S. territories. Then, in August, NSF announced 16 finalists for the first full-scale Type-2 NSF Engines. NSF anticipates announcing the NSF Engines awards this winter, with each awardee initially receiving approximately $15 million for the first two years. Through these two tracks, NSF will have invested nearly $200 million in regional innovation throughout the country by the end of this calendar year.

While NSF is excited by the broad geographic distribution and extensive engagement across academia, industry, and other sectors, we also know that more must be done to fully engage the talent that exists throughout the Nation. That is why NSF launched the Enabling Partnerships to Increase Innovation Capacity (EPIIC) program. EPIIC will build capacity among minority-serving institutions, two-year institutions, undergraduate institutions, and other emerging research institutions in regional innovation ecosystems, with the hope that they will go on to participate in an NSF Engine or similar regional innovation activity. NSF recently announced its first-ever EPIIC investment of $19.6 million to 49 institutions (via 47 awards) at U.S. institutions of higher education (IHEs), including teams from historically Black colleges and universities (HBCUs), Tribal colleges and universities (TCUs), and minority-serving institutions, including Hispanic-serving institutions (HSIs), and community colleges. Importantly, in this inaugural cohort of NSF Engine Development Awards, NSF Engines finalists, and EPIIC awards, NSF is touching 48 states plus multiple U.S. territories.

NSF and the Department of Commerce are collaborating closely together on regional innovation efforts. NSF and the Economic Development Administration (EDA) share a mutual commitment to regional innovation and economic development in communities across the Nation. The CHIPS and Science Act authorizes both agencies to implement programs to enable regional technology development and economic and job growth through the NSF Engines and the EDA Regional Technology and Innovation Hubs programs. In July, NSF and EDA signed a memorandum of understanding to officially enable cross-agency coordination on these critical programs to ensure they contribute to regional economic growth and U.S. competitiveness in key technology areas.

In addition to incubating regional innovation, NSF has also prioritized investing in the workforce the Nation needs to be successful today and into the future. NSF invests in the entire spectrum of STEM education and training, from K–12 students and teachers; to technical and vocational training; to undergraduate, graduate, and postgraduate researchers across all fields of science, engineering, and technology. For example, NSF's Experiential Learning in Emerging and Novel Technologies (ExLENT) program will support inclusive experiential learning opportunities designed to provide cohorts of diverse learners with the crucial skills and support services needed to succeed in the key technology focus areas and prepare them to enter the workforce ready to solve the Nation's most pressing societal,, national, and geostrategic challenges. NSF just recently announced the first-ever ExLENT awards to 27 teams at U.S. institutions of higher education and nonprofits, including teams led by historically Black colleges and universities and minority-serving institutions, representing a total investment of $18.8 million.

Equally important to the Nation's competitiveness is NSF's commitment to funding exploratory-based research that creates new knowledge and seeds the industries of tomorrow. For example, many of the AI advancements making news today—both the innovative products and the talent that is developing them—are made possible by NSF's long history of investments dating back decades. From reinforcement learning, which supports more effective chatbots, inventory managers, and self-adjusting thermostats, to the deep learning techniques that have led to generative AI, NSF's investments built the foundation for the AI tools and applications of today. This technical foundation has also been critical for our defense and intelligence communities, translating into capabilities that underpin national security. Over the past three years, NSF has established 25 National AI Research Institutes, or AI Institutes, in partnership with other federal agencies and industry. This $500 million in-

vestment touches almost every state, supporting cutting-edge research that is applying AI to key economic sectors like agriculture, weather, and public health.

Another example of NSF's commitment to investing in foundational breakthroughs is the recent announcement of a $162 million investment in nine new Materials Research Science and Engineering Centers (MRSECs) that will each receive $18 million over six years. The centers aim to transform fundamental scientific breakthroughs into tangible benefits for multiple sectors of the U.S. economy and innovations that can be produced on tomorrow's factory floors—from being tough enough to withstand the heat of a fusion reactor to processing information at the quantum level. Since the 1970s, NSF's MRSECs have yielded countless breakthroughs, from shape-morphing materials to plastics that conduct electricity. NSF now supports 20 MRSECs and these most recent investments expand the centers' portfolios to pursue a broad range of research projects to unlock new capabilities in several areas: semiconductors, artificial intelligence, biotechnology, sustainable energy sources and storage, advanced manufacturing, quantum computing and sensing, and other areas critical for U.S. leadership in materials research.

Early last month, NSF announced four new Science and Technology Centers (STCs) that will enable advances in fields ranging from cell biology and complex materials to new applications of sound waves and environmental change. Since it was established in 1987, the STC program has supported exceptionally innovative, complex research and education projects that have opened new areas of science and engineering and developed breakthrough technologies. STCs conduct world-class research through partnerships among institutions of higher education, national laboratories, industrial organizations and other public or private entities, and via international collaborations. They provide a means to undertake groundbreaking investigations across disciplines and highly innovative approaches within disciplines. They also play a fundamental role in engaging, recruiting, retaining, and mentoring the next generation of scientists and engineers from groups underrepresented in STEM.

The CHIPS and Science Act reiterated the importance of NSF's mission to invest in exploratory, curiosity-driven research. NSF will continue to make significant investments in center-scale research such as the MRSECs and STCs, as well as in the individuals all across the Nation to ensure we are exploring the frontiers of science and engineering and leading the world in innovation.

Safeguarding Taxpayer Investments

The future of U.S. competitiveness requires that we safeguard these critical investments and take steps to address research security while also cultivating vibrant international partnerships that are critical to success. NSF plays a leading role in Federal efforts to address research security and is expanding capabilities and competencies to protect the U.S. science and engineering enterprise. In January 2022, the National Science and Technology Council's Research Security Subcommittee, which is co-chaired by NSF, issued implementation guidance for National Security Presidential Memorandum 33 (NSPM–33) on National Security Strategy for United States Government-Supported Research and Development. In addition, the CHIPS and Science Act contains several research security provisions that NSF is in the process of implementing. NSF has engaged in robust discussions with the U.S. research community and with like-minded international colleagues through groups like the G7 and bilaterally to develop common frameworks for understanding and addressing research security.

NSF has prohibited our staff from participating in any foreign talent recruitment programs and updated and clarified our guidelines and requirements for institutions and individuals requesting funding from NSF so that senior/key persons identified on proposals cannot participate in malign foreign talent recruitment programs. NSF has also established new analytic capabilities to proactively identify conflicts of commitment, vulnerabilities of pre-publication research, and risks to the merit review system. NSF will scale up the use of these analytics to analyze all NSF awards and contribute to NSF's Small Business Innovation Research (SBIR) due diligence process in FY 2024.

As required by the CHIPS and Science Act, NSF is in the process of establishing a Research Security and Integrity Information Sharing and Analysis Organization (RSI–ISAO), called SECURE, to provide needed information and tools to the research community. Full proposals for SECURE are due at the end of October. NSF is confident that we will be able to establish an innovative entity that will build the capacity of the research community to make risk-informed decisions and create a trusted partnership between research-awarding agencies and the research communities, which strengthens the security of our national research enterprise.

NSF is also leading efforts through a partnership with the Federal government interagency community to develop research security training modules for the research community. These modules will be available in the coming months, and NSF plans to fund the delivery of these modules and their evaluation to help researchers understand and avoid research security risks. In addition, NSF has also put in place research security training for all of our staff, which is required to be completed on an annual basis.

NSF is developing the system for reporting by institutions of higher education of foreign financial transactions with countries of concern above $50,000 as mandated in CHIPS and Science and will be coordinating closely with our Office of Inspector General on these reports. NSF will do appropriate due diligence to assess these reports.

NSF takes very seriously the need to safeguard the investments the agency makes on behalf of the American taxpayer while also contributing to a vibrant global research community based on shared values with like-minded partners. We will continue to partner with other agencies, the intelligence and law enforcement communities, and the research community to take all necessary steps to do so.

CHIPS for America Workforce and Education Fund

The CHIPS and Science Act included $200 million for the CHIPS for America Workforce and Education Fund. NSF is investing those resources in an effort to train upwards of 100,000 new semiconductor researchers, practitioners, technicians, and educators over the next five years, fulfilling a key need of the semiconductor industry and further building a skilled U.S. semiconductor workforce. The CHIPS and Science Act provided $25 million in each of FY 2023 and 2024, and $50 million in each of FY 2025, 2026, and 2027.

NSF has focused the FY 2023 funding to leverage existing investments to address the immediate needs of the semiconductor industry. For example, $10 million was provided to the TIP Directorate to fund scalable partnerships with the private sector, including Intel, Micron, Ericsson, IBM, and Samsung to enhance research traineeships and skilled semiconductor manufacturing workforce programs. This NSF investment will be matched by the companies. For example, in the case of Intel, the investment is part of an already-announced 10-year NSF-Intel partnership to invest $100 million to address semiconductor design and manufacturing research and workforce development throughout the country.

NSF also invested more than $6 million of the FY 2023 funds in the new Future of Semiconductors (FuSe) program. The objective of this investment is to cultivate a broad coalition of researchers from across science and engineering communities to utilize a holistic, co-design approach to fundamental research and education and training, to enable rapid progress in new semiconductor technologies. Last month, NSF announced 24 research and education projects with a total investment of $45.6 million through a public-private partnership spanning NSF and four of the companies named above: Ericsson, IBM, Intel, and Samsung. These awards support novel, transdisciplinary research that will enable breakthroughs in semiconductors and microelectronics and address the national need for a reliable, secure supply of innovative semiconductor technologies, systems, and professionals.

In FY 2024, NSF will focus on supporting a national-level clearinghouse that brings together academia, industry, and government to grow capacity and reduce barriers to grow a diverse workforce capable of ensuring U.S. competitiveness across all facets of microelectronics. Such a microelectronics workforce development clearinghouse will offer a proving ground for reliable, practicable, evidence-based, industry-aware curricula leading to new educational programs spanning secondary schools, two-year community and technical colleges, and minority-serving institutions across all 50 states, the District of Columbia, and U.S. territories. In doing so, NSF will enhance industry and career awareness among a diverse array of potential entrants to the industry, develop professional and technical skills, and provide work-based, experiential learning opportunities (*e.g.,* internships, apprenticeships) that inspire prospective students to enroll in industry-related programs at community colleges and four-year universities. This approach has been recommended by coalitions of academia and industry as they have imagined how best to address the needs of the future semiconductor workforce.

Put simply, this clearinghouse will foster high-quality and affordable training pathways aligned with the Administration's workforce approach, benefiting workers as much as they benefit employers, by setting workers on pathways to success in higher-quality careers in the long run.

As the Federal Government's leader in STEM education, with a strong track record in fostering public and private partnerships, NSF is uniquely positioned to design, implement, scale, and sustain this clearinghouse. Moreover, success in the

semiconductor and microelectronics sector will provide an evidence base for extending other key technology areas authorized in the CHIPS and Science Act. NSF is committed to investing the $200 million provided for the CHIPS for America Workforce and Education Fund and leveraging public-private partnerships to have the most impactful outcomes for the Nation.

Innovation Anywhere, Opportunities Everywhere

NSF is fully committed to the development of a future-focused science and engineering workforce that draws on the talents of all Americans, in every region of the country. The CHIPS and Science Act authorizes NSF to support broadening participation at the individual, institutional, and jurisdictional levels. At the individual level, CHIPS and Science authorizes programs that empower individuals through scholarships, fellows, traineeships, and project activities that enrich STEM education at all levels. At the institutional level, awards to minority-serving institutions, including community and technical colleges, will lead to greater opportunities for all students and faculty. Finally, at the jurisdictional level, NSF is working toward more geographical diversity across the entire NSF portfolio, especially to rural and urban institutions that serve diverse students.

An important component of these efforts is NSF's Established Program to Stimulate Competitive Research (EPSCoR). EPSCoR enhances the research competitiveness of targeted jurisdictions by strengthening science, technology, engineering, and mathematics (STEM) capacity and capability through a diverse portfolio of investments from talent development to local infrastructure. The CHIPS and Science Act requires NSF to increase the percentage of the agency's investments in EPSCoR jurisdictions over a seven-year period, reaching 20 percent in FY 2029. For FY 2023, the EPSCoR target was 15.5 percent. We are pleased to report that NSF has met and slightly exceeded that target in FY 2023. In addition, as required by the CHIPS and Science Act, NSF is prioritizing activities that enable sustainable growth in the research competitiveness of EPSCoR jurisdictions. For example, in May, NSF released two new programs to further support EPSCoR jurisdictions in building sustainable research capacity. The EPSCoR Research Incubators for STEM Excellence (E–RISE) program supports incubation of research teams and products in scientific topical areas linked to a jurisdiction's scientific priorities. The EPSCoR Collaborations for Optimizing Research Ecosystems (E–CORE) program provides funding to support targeted research infrastructure cores that underlie the jurisdiction's research ecosystem, including development, enhancement, and/or sustainability of research facilities, higher education pathways, workforce development, economic development, and use-inspired research.

NSF recognizes that building sustained research capacity in all states and territories is critical to our long-term competitiveness. NSF's Growing Research Access for Nationally Transformative Equity and Diversity (GRANTED) program will improve the Nation's research support and service capacity at emerging and underserved research institutions. Last week, NSF announced an investment of $9.2 million in funding for a collaborative project between Emory University and the National Organization of Research Development Professionals (NORDP), a professional nonprofit association dedicated to advancing the research capacity and impact of colleges and universities. Together they will expand support to 16 minority-serving institutions by providing extensive consulting time from experienced NORDP consultants over the next two years and access to an array of tools and services to improve research development. This investment will provide direct research development services to participating institutions, including grant writing assistance, team building, strategic research planning, outreach activities, and student training. The program is specifically designed to provide a significant investment to intentionally small cohorts of institutions to ensure a lasting impact.

Conclusion

At a time of intense international competition, NSF's ability to generate more breakthroughs and foster more innovations that strengthen our economy and national security is critical to keeping the United States a global leader in science, engineering, and technology. As NSF continues to implement the CHIPS and Science Act, we are doing so with a focus on expanding opportunities for all types of institutions, in every geographic region, in every key technology area, and for everyone who wants to engage in STEM –while through leveraging partnerships with industry and philanthropies.

Thank you for the opportunity to testify before you today. With the continued support of this Committee and Congress, and through successful implementation of the CHIPS and Science Act, NSF stands ready to strengthen our national and economic security and create innovation anywhere and opportunities everywhere.

The CHAIR. Thank you, Director.

Colleagues, note that a vote has started. We are going to have a couple of votes this afternoon, so I will just ask you to use your discretion where you are in the queue to go back and forth and try to maximize time.

I am going to turn it over to my colleague, Senator Schatz. And go vote, and then come back. And he will chair the meeting and go to Senator Cruz after that.

STATEMENT OF HON. BRIAN SCHATZ,
U.S. SENATOR FROM HAWAII

Senator SCHATZ. Thank you, Chair, Ranking Member.

Director Panchanathan, thank you for being here. I want to follow up on a conversation we had earlier this year. I know that you made $6.5 million available in Fiscal Year 2023 for the continued development of the Thirty Meter Telescope. What are your plans for continuing the funding and the work to design TMT in fiscal 2024?

Dr. PANCHANATHAN. Thank you very much, Senator Schatz, and I really enjoyed talking to you and visiting the great State of Hawaii recently. We launched the telescope, as you know, the solar telescope in Maui, which is the world's largest solar telescope, and I am very proud that we have it located in Maui, we are doing great science.

To your specific question, I am happy to tell you, as you said, just last week, NSF made a $6.5 million award to the Giant Magellan Telescope, for GMT, and a $6.5 million award to the Thirty Meter Telescope International Organization, (TMT), to continue development and reduce risk on crucial optical and mechanical components.

I want to tell you that there is a process that we take as we embark on large awards, and this includes, not only the Astro2020 Decadal Survey recommendations that came, consultations with our scientific community, and advisory committees, as well as our Mathematical Physical Sciences Directorate, making sure that we are prioritizing these investments, working with our National Science Board, and so now we are investing in the design and development phase, and that was this investment; so we have plans in terms of how do we move from here to the final design review and then the investment.

Senator SCHATZ. So that is 2023?

Dr. PANCHANATHAN. Yes.

Senator SCHATZ. You are mostly talking about 2023. So what are your plans for 2024?

Dr. PANCHANATHAN. In 2024, we have budgeted again to continue with this process, and we have asked for $30 million of investment so that we will be able to move these projects forward as these review processes happen. And at the same time, I would like to place this in front of Congress. You know that in the CHIPS and Science Act, the science provisions were authorizations, not appropriations yet. We need that also in place so that we might be in the vanguard of innovation and scientific discovery, for which instrumentation like TMT and GMT are very important as we think about the future.

Senator SCHATZ. Thank you. Now, talk to me about construction funds for 2025. Obviously, you are talking about design. Where are we on construction, and can we work together on the Pathway? I understand there a lot of it is contingent. You have Astro2020; you have the Scientific Review process.

Dr. PANCHANATHAN. Yes.

Senator SCHATZ. We obviously don't have it squared away on the Hawaii side of this, but we have to move in parallel paths in case everything comes together. So where are you with 2025 and construction money for ELT?

Dr. PANCHANATHAN. Again, thank you for that. And yes, you are right. We are going through the process that we typically go through in the Major Research Facilities Instrumentation. So we are looking at the 2024, 2025, and beyond in terms of what is the right positioning for the request to be made for the construction project.

Right now, we have to go through the final design review. And as you said, rightly, we are working with the State of Hawaii to make sure that we are positioning the appropriate investments in a way that they can, you know, be sequenced at the right time. So it is our—we are still working through the 2025, and we will be working through 2026 budgets to think through when the appropriate time is for putting in the construction request.

But the final design review we have to also go through as we are thinking about how we are moving forward in this process. And we will be working closely with the National Science Board on this.

And Senator, as we have always done, we will keep your staff closely informed and closely engaged to ensure that you are getting all the answers that you need.

Senator SCHATZ. Thank you very much.

Senator Cruz.

Senator CRUZ. Thank you, Mr. Chair.

Secretary Raimondo, the National Environmental Policy Act, or NEPA, the NEPA reviews are currently required for CHIPS grants, and that could lengthen project timelines by two years or more from the date the Department decides to start an environmental impact statement. Some NEPA reports aren't completed for 7 years or longer.

When you were asked about hurdles posed by NEPA to CHIPS projects in a House hearing last month, you pointed out, quote, "There is currently a bipartisan amendment to the Defense Authorization Act which would help a lot. So we are going to do everything we can with our team to help streamline NEPA and move it as quickly as is prudent, but if Congress could pass the amendment, I think it is the Cruz-Kelly Amendment in the Authorization Act, it would help us a lot to move faster."

As you know, that bipartisan amendment passed the Senate with overwhelming bipartisan support, but it is not yet law. It still has to pass the House, and ultimately be signed into law by the President. Could you briefly describe the benefits the amendment would provide as a word of encouragement to the House and the White House to make it law?

Secretary RAIMONDO. Yes, thank you. And thank you for your leadership on that, as you say, each of these projects, if they re-

ceive Federal money, would be subject to NEPA, which could take up to years. We do not have years. These are national security imperative projects, which is why I, again, thank you for your leadership. What we are doing, we have built a team on the CHIPS Team in the Commerce Department just to focus on permitting, to help companies, help states streamline the process, accelerate the process within the existing statute.

Let me be clear; we don't want to—you know, environmental concerns matter. We are not in any way suggesting that we should do anything that hurts the environment or is unsustainable. That being said, we do need to, which your amendment would do, streamline the process, speed the process, make the process more efficient and user-friendly.

Interestingly, earlier today, I was on the phone with members of the House on this exact issue, encouraging them to do their own—you know, take your lead and pass something in the House. My view is it is essential. We are going to do everything we can. We have a team, we are working on it, but without the legislation, it is very difficult.

Senator CRUZ. Well, that is very helpful. Thank you. Let me turn to the topic of spectrum, something both you and I care a lot about. We all know that the United States needs more commercial access to mid-band spectrum. Recent studies project that U.S. mobile traffic to increase more than two-and-a-half times over the next 5 years, and almost sixfold in the next 10 years. We need a real mid-band spectrum pipeline so that the U.S. can dominate in 5G and not fall behind our adversaries.

Unfortunately, access to mid-band spectrum has become almost impossible to come by because so much of the Nation's spectrum is under the control of Federal agencies who are resistant to sharing. The Defense Department recently completed its report on opening access to spectrum in the lower 3 gigahertz band and gave it to your Department at the end of last week. The report has not been made public, but according to leaks, the report does not support sharing, let alone allowing full power 5G use of the band.

Secretary Raimondo, you and I had a very productive call yesterday, and during that call, you committed to sharing the report with me, briefing me on it. I appreciate that. Do you agree that we need more mid-band spectrum to be made available for 5G, including for full-power use, and that it is not only imperative for our economy but also for our national security?

Secretary RAIMONDO. I do. Let me say this. As I said yesterday, I think—I would be very happy to have my staff, the NTIA, and the DoD, I think we should do it together, to come and go through the report. So we will set that up.

Senator CRUZ. I appreciate that.

Secretary RAIMONDO. And yes, I do. I spoke with Secretary Austin last week, and I said the DoD needs the spectrum; they need to execute their mission, period. Having said that, we also need to be more creative and innovative about how we share spectrum and how we use spectrum, because the truth of the matter is our national defense depends on, as you say, continued private sector innovation, and continued innovation in 5G.

And my point to him, my point to you, and anyone who wants to hear from me is that this shouldn't be a zero-sum game, right. We shouldn't think every time the DoD shares or gives something up, they are losing capacity. We have to find creative ways where we can have more spectrum made available in the mid-range band, as you say, and also, the DoD has what they need to do their mission. I am committed to working with you and with them to do that.

Senator CRUZ. Thank you, Madam Secretary.

Director Panchanathan, during Fiscal Year 2021 and Fiscal Year 2022, the NSF funded some 70 grants and two contracts totaling over $45 million focused on both the quote/unquote "Science of countering social media mis- and disinformation, as well as the development of digital tools to track and censor so-called mis- or disinformation."

One of the projects was called "Expert Voices Together", and it is, to quote the NSF, "Creating a comprehensive system of care that addresses the harms journalists experienced due to online harassment." Its mission, incredibly enough, is to, "Support journalists in moments of crisis while helping the media industry build resilience long-term"; in other words, taxpayer-funded therapy for left-wing journalists who find actual facts traumatizing. I am sure people like Taylor Lorenz will be excited about that.

But where on earth in the NSF's mandate is there a justification for these sorts of projects? And do you believe that venturing into such politicized topics undermines broader support for the NSF?

Dr. PANCHANATHAN. Senator, first of all, let me tell you that the reach—I hope that through the hearing today, you will get to see NSF's broad impact all across our Nation through STEM talent development, through economic vibrancy that NSF makes possible, and yes, national security objectives also being fostered. I hope that the examples that I will give you in the answer, I am not trying to package all of that, but I hope that, you know, that will come through very clearly. We are doing a lot of work about how to make sure the talent everywhere and innovation everywhere is energized.

Senator CRUZ. Could you answer the question, though, that I asked.

Dr. PANCHANATHAN. Yes, I am just going to come to that, Senator. Because I just want to make sure that the NSF mission is—you know, I just want to make sure that that is clearly understood also. You know, I want to say one thing very categorically: We do not—NSF does not engage in censorship, we do not regulate any content, and engage with anybody who also does so.

But what we do is, how do the technologies operate and how are they being used? And provide the public and policymakers the information that they need so that you can make the informed decisions about needed regulations and guardrails. And for the users, that they have the tool that they can safely navigate content. That is what NSF is engaged in, that is the kind of projects that we fund. We are not in the business of censorship. We are not in the business of controlling content.

I can tell you, for example, even in this conversation that we are having right now, in the deep-fake realm, this conversation can be

completely altered and presented in a form that you and I will say: How did it even happen that this conversation that we are having right now has been transformed into something that is even unrecognizable? These kinds of things that happen, we are trying to find how can we build, how can we invest in those projects, and how can we invest in tools and techniques that can help safeguard. And that is all we are doing. We are not censoring. And I want to repeat that we are not altering content.

Senator CRUZ. When you are funding others who are engaged in censorship, you are undermining support for your very important agency.

Dr. PANCHANATHAN. Senator, maybe I can close with this comment. I am happy to work with any of you to go through this with you in more of a one-on-one setting, and explain what these projects are doing so it can be helpful. Happy to take your suggestions, happy to take your inputs, NSF, I always say, NSF is a learning agency. We learn constantly because we cannot be an agency that says, this is how we do it. We are a learning agency. So happy to take the input and see where, if any, you find that there is, you know, NSF appearing to be, as I have said, we are not, but I am happy to have the discussion with you.

Senator CRUZ. Thank you.

The CHAIR. Senator Tester.

STATEMENT OF HON. JON TESTER,
U.S. SENATOR FROM MONTANA

Senator TESTER. Thank you, Madam Chair, and I appreciate the flexibility. Gina and Panch, thank you both for being here. I appreciate the work you have done, I appreciate everything you are doing to bring jobs back to this country, and I appreciate everything you are doing on the national security front. Look, for decades we have outsourced jobs in this country, and it hasn't been a good idea.

The Chinese Communist Party is our facing threat, and you both know this, both economically, and militarily, and they want to take our place on the world stage. But I have faith in this country, and I have faith in our ability to be able to emerge from a time when we have outsourced our jobs to time, and we can bring the jobs back here again and create what we need in this country to meet the needs of this country.

A little over 2 years ago, Congress started debating the CHIPS and Science Act. I started talking to a group of Montanans about building a technology hub in Montana using the Regional Technology Innovation Hubs Initiative that this committee created. The vision for this tech hub would be to establish Montana's well-established photonics industry and grow it into a world-class center that can out-compete everyone in technology, and it is critical to our economic growth and national security.

Madam Chair, I am blown away by the effort that Montanans have put forth on this opportunity. Our best and our brightest have worked together, universities, labor groups, financial groups, state government, have all have worked to craft a Tech Hub Plan that works for our state, but most importantly, works for this country.

Like any state, funding for universities is not what it should be. And so these universities are used to fighting and beating the hell out of one another to get the money they needed, and the truth is, is we have watched them work together.

I come from a state that was built over a hundred years ago by people who moved in where there was no grass, and built farms, where there was just grass, and built communities, and built churches, and built hospitals. And now, the people in this state of Montana are working together to make sure that Montana can reclaim what we need to have, from a technology standpoint, to be the Nation's or the world's leader.

So my question is this, to both of you: When it comes to rural America, Congress has addressed it in a certain—in several different ways, but you both lead implementation of programs at your respective agencies, how do you address the issue of rural America and making sure that your initiatives will work for rural America and do not leave them behind? I don't care which one goes first. Go ahead.

Secretary RAIMONDO. Thank you. I will go first, and I will be brief. We, as I said earlier, we have been overwhelmed by the quality and quantity of the tech hub applications. As you recall, it was authorized for $10 billion. We received $500 million, and we have over 400 applications. So if you come away with nothing else, clearly this is worthy of more funding.

We will do a minimum of 20 Tech Hubs, possibly more, and I promise you some will be rural. I cannot promise you it will be Montana, but I promise you some will be rural.

Senator TESTER. I was hoping for a different answer. But keep going.

Secretary RAIMONDO. I know that. I know, but I am trying to be honest here. I promise we will look at yours and all of yours, and there will be rural representation. We are determined to do it; the statute requires it. We are doing a huge amount of outreach. I tell my team there is no substitute for showing up. Show up in rural communities, let them know we are there, and help them to put forward a good application. So we are highly conscious of it, and we are doing a lot of outreach.

Look, the only thing I would say is if we pick, say, 20, hypothetically, 20, every one of those would be worthy of, say, a $100 million grant to really move the needle and create a hub, that is $2 billion. We have $500 million, and you have authorized $10 billion (ph.). So I guarantee you we are focused on rural. I guarantee you, you will be pleased with the results, and I guarantee you this program is worthy of more funding.

Senator TESTER. Thank you. Panch?

Dr. PANCHANATHAN. Thank you very much, Senator. It was great meeting with you. And when I spoke to you, and I want to reinforce that NSF's commitment of energizing talent and ideas everywhere across our Nation is in full force and is actioned everywhere now, even as we speak.

But let me address specific things related to your question about two projects that even just got funded very recently, in terms of unleashing innovation in the State of Montana. This is to Montana State University in Bozeman; they are leading an NSF Engines De-

velopment Award. These awards are meant to bring all of the innovative capacity in every region to see how we can lift them up through partnerships, as well as NSF seeding investments. That then can then further be built with the higher level of NSF Type 2 Awards. And partnering with Commerce and EDA, we have signed an MOU of regional technology hubs, how we can work together. We are like this, we are not like this anymore.

[Interlocking fingers of both hands.]

Dr. PANCHANATHAN. You know, Secretary Raimondo will agree with, you know, the fact that because of her leadership and her commitment to working in partnership, the two of us are working closely together, our Departments are working closely together, and we don't want anything to fall in between. So this project, for example, is focused on advancing quantum and supporting technologies in the northern intermountain States of Montana, Wyoming, and Idaho.

There is another one, which is University of Montana in Missoula, is leading the NSF Engines Development focused on advancing Precision Forestry, which is, you would agree, there is much more in place innovation and range land technologies. So these are just—the awards that were made just a few weeks ago, so you can see that we are constantly exploring options, working with the communities to see what we can do in terms of talent development, as well as innovation, and energization.

Senator TESTER. Thank you. Thank you, Madam Chair.

The CHAIR. Senator Wicker.

STATEMENT OF HON. ROGER WICKER,
U.S. SENATOR FROM MISSISSIPPI

Senator WICKER. Thank you very much, Madam Chairman, and thanks to our two witnesses. I bet neither one of you is surprised that we have had questions already about rural America. And so Dr. Panch, let me just ask you, since you were specific to Montana, which is a state I really admire, could you tell us the EPSCoR part of the legislation, how that is already, perhaps, benefiting researchers in other rural states? And that won't be the last——

Dr. PANCHANATHAN. Thank you very much, Senator, for posing that question. First of all, thank you for hosting me in the great State of Mississippi.

Senator WICKER. Yes. Thank you. And I believe Mississippi was the first state where we were able——

Dr. PANCHANATHAN. That is the first state we had the NSF Day Celebration, right?

Senator WICKER. Yes.

Dr. PANCHANATHAN. So it was a great launch effort, and it was wonderful to meet all the different institutions in the State of Mississippi, community colleges, all the higher education institutions coming together, and that we were able to interact with the researchers and students.

Now, to the State of Mississippi, I saw firsthand, and this confirmed my belief that talent and ideas are democratized, and they are everywhere. Now, in the State of Mississippi, we have now invested, and I am going to go through a few projects in the State of Mississippi, again, very recent ones. Again, the NSF Engines De-

velopment Award, the first of those to Jackson State University, focused on advancing food security and climate resilience.

Senator WICKER. We have a new Senator who is alum of Jackson State.

Dr. PANCHANATHAN. That is right. And then the next one is to Mississippi State University in Starkville, where we were together. This is advancing autonomous technologies for advanced manufacturing. We talked about this when we were together with the researchers there. In addition to that, we have invested almost a million dollars in the Mississippi Gulf Coast Community College on two projects, to broaden participation in emerging technology programs, as well as increasing the supply and diversity of the IT workforce in the Mississippi Gulf Coast region.

These are real projects making a real difference in terms of unearthing the talent and ideas in Mississippi and to the EPSCoR targets that you and I had a discussion. If you recall, in your office, we said—you asked me the question: Do you think that you will meet those targets for Fiscal Year 2023 and then going on to Fiscal Year 2029? I am happy to report to you today, in Fiscal Year 2023, we not only met, but we exceeded the target. And that these are mutually beneficial.

Senator WICKER. Well, thank you very much, and you may want to supplement your answer further. Let me just say, I really don't think this legislation would have passed so easily had we not been able to include the EPSCoR provision. And I do want to thank the Chair for her help, on a bipartisan basis, in that regard.

And Madam Secretary, you may want to answer, on the record, about Rural America. But let me go ahead and see if I can follow up on something that Senator Cruz mentioned. Do I understand that you have, you and your office, have seen the completed report concerning the Lower 3 Gigahertz Study?

Secretary RAIMONDO. We got it at the end of last week, yes. Yes, we got it at the end of last week.

Senator WICKER. OK. And so do I understand you to say that there are areas of the report that you disagree with?

Secretary RAIMONDO. I have not gone through it all myself, so you could not understand me saying that. We received it, I think, on Friday.

Senator WICKER. OK. Well, what did you say with that regard?

Secretary RAIMONDO. What I said is this, we need to do a better job of being more creative in figuring out ways to have more of that mid-band spectrum available for commercial use to power innovation in ways that do not interfere with, or in any way degrade the DoD's mission.

Senator WICKER. OK. Well, let me just say I agree with that statement that you just made as you had—as you said it. And to the extent that the report coming from the Department of Defense is more restrictive in that regard, I would have a problem with that; when are Members of the Committee and Members of the Senate going to be able to see this report?

Secretary RAIMONDO. As I said, we just received it, I think, on Friday of last week. We are going through it now, and I would be happy to follow up, and we will have a briefing schedule where the DoD, and NTIA can come over whenever you want.

Senator WICKER. Madam Chair. I do like the idea of a briefing. I really think it is less formal, and there is more of an opportunity for give and take.

Secretary RAIMONDO. Yes.

Senator WICKER. But I think to the extent you say there is room for both sides to benefit and for neither side to have a loss, and I even—I am reluctant to say "side", either Department or area of endeavor to have a loss, that is not necessary in splitting the blanket in this regard.

Secretary RAIMONDO. That is my point. I think historically the debate has been approached. Anytime DoD gives up anything, it is a loss, and I think we have to modernize our thinking. There are ways that, if we are creative, they can have everything they need, and also we must make more available for private innovation because that advances national security as well.

Senator WICKER. National security benefits from both. Thank you. And thank you, Madam Chair.

The CHAIR. Thank you, Senator. We will take you up on the briefing.

Secretary RAIMONDO. Sounds excellent.

The CHAIR. Thank you. Senator Klobuchar.

STATEMENT OF HON. AMY KLOBUCHAR,
U.S. SENATOR FROM MINNESOTA

Senator KLOBUCHAR. Thank you very much, Chair Cantwell. It is good to see both of you. Secretary, thank you so much for your visit to Bloomington, Minnesota.

Secretary RAIMONDO. It was great.

Senator KLOBUCHAR. You are a big hit there, and at Normandale Community College, and I think you saw there that we are one of just a few states that have a full existing semiconductor supply chain: design, fab foundries, toolmakers, integrators, gas chemical producers, testing, packaging, you name it. Could you talk about how the Commerce Department is working to support smaller companies looking to get involved in that supply chain?

Secretary RAIMONDO. Yes, I loved the visit. So thank you for having me. Of the $39 billion, we have said about $10 billion will be used for mature legacy and supply chain. So there will be a great deal of money available for smaller companies and supply chain companies, like some of the ones that we met with. You know, I can assure you that that will happen. And just as I said earlier, we have received 500 statements of interest from, I think, 42 states, and over 100 applications or pre-applications. Many of those are smaller companies, supply chain companies, so rest assured that we are looking at those opportunities, not just the very biggest companies that we all know about.

Senator KLOBUCHAR. All right, thank you. And then, given that you visited our community college there, Normandale Community College, can you talk about, given that we need 100,000 new semiconductor technicians, and another 140,000 people in the trades to build semiconductor manufacturing facilities, and I think we have a shortfall of about 300,000 engineers, 90,000 skilled technicians in the U.S., could you talk about the importance of community colleges, and one-and 2-year degrees, and all of this?

Secretary RAIMONDO. So one of the most exciting facts, I think, in the time that the bill was signed between then and now, we know of at least 50 community colleges in 19 states that have announced new programs to help American workers find jobs in the semiconductor industry. I mean, I think that is amazing, just the fact that the passage of the bill, community colleges are mobilizing to say: How do we fill the gap of 100,000 technicians that we are currently short?

We, of course, will be establishing the National Semiconductor Technology Center, and a huge component of that will be workforce, and we will do that in collaboration with the NSF. And community—I should say, everyone has a role to play; high schools with careers in technical education, community colleges have a huge role to play, 4-year colleges, Ph.D. programs, up and down the ladder. I think community colleges, though, in training technicians, cyber technicians, processing analysts, et cetera, have a particular role to play, and we are already working with them.

Senator KLOBUCHAR. Well, thank you, and what a great transition.

Quickly to Director Panch, you mentioned all degrees, and I know that you are going to be visiting the University of Minnesota. You met the interim president when you were visiting, Secretary. Could you talk about, I know they are one of the finalists in the NSF Regional Innovation Engines Program. In your view, how can public-private partnerships, Dr. Panch, help to accelerate innovation?

Dr. PANCHANATHAN. Very, very important to have public-private partnerships. In fact, our Regional Innovation Engine Program was created with the explicit purpose of how we might bring all of the component parts together to ensure that the innovation is completely, you know, energized and catalyzed.

So our Regional Innovation Engines Program, 44 awards have been made, where 46 states and territories are involved in this. Every one of those awards has a number of industry partners, state governments being—partnering in that, and sometimes even nongovernmental organizations, NGOs being partners in that. And we have, of course, community colleges, technical colleges, K–12 institutions, as well as universities, research universities. So this is exceedingly important.

Let me give you a couple of examples if this will illustrate the point very clearly. We earlier talked about, you know, 6G and 5G. We call it the NextG, let us say. So the Resilience Intelligent Next Generation System, or the RINGS Program has 35 companies participating in the RINGS Program, and the total amount of resources that they bring to the table is $50 million in-kind and actual investments. NSF matched that with another $50 million to now have a very robust program of looking at: How do we build the next-generation networks, including rural broadband being made accessible so that talent and ideas can have access to all the content that we are generating all across our nation?

So to the community college, because you asked that question, I cannot but help tell you about this community college, Hennepin Technical College.

Senator KLOBUCHAR. Yes, that is in my state.

Dr. PANCHANATHAN. It is leading an NSF Advanced Technical Education, ATE, this program has been invoked for a long time, essentially community colleges, which are invested in for new curriculum, model curriculum, as well as in terms of students.

Senator KLOBUCHAR. OK. Very good. Thank you. And we look forward to your visit.

Dr. PANCHANATHAN. I look forward to being with you.

Senator KLOBUCHAR. We expect you to be wearing a Gophers' hat when you are there, just to bother Senator Fischer with her Nebraska Team.

Dr. PANCHANATHAN. Thank you.

Senator KLOBUCHAR. But I also want to thank the Chairwoman for her incredible leadership on this bill. We wouldn't be where we are today if it wasn't for Senator Cantwell. Thanks.

The CHAIR. Senator Fischer. Thank you, Amy.

STATEMENT OF HON. DEB FISCHER,
U.S. SENATOR FROM NEBRASKA

Senator FISCHER. Thank you, Madam Chairwoman; and thank you to both of our witnesses for being here today. Between your two agencies, you have received more than $54 billion in appropriations under the CHIPS and Science Act so far. This is an enormous amount of taxpayer money.

Earlier this year, the Commerce Department's Inspector General described the novel challenges facing the implementation of CHIPS. The IG highlighted the need for new controls and appropriate oversight for this unprecedented influx of funding, stating that it, quote, "May require additional monitoring and reporting to ensure project recipients comply with statutes, achieve intended outcomes, and use funds efficiently."

The Inspector General has also noted that contract and grant fraud now account for 65 percent of the OIG's Department of Commerce cases. Before fiscal 2021, they represented roughly 35 percent.

Secretary Raimondo, have you planned to implement any specific oversight measures to respond to this concerning development that we are seeing?

Secretary RAIMONDO. Yes. Thank you, Senator, and thank you for the question. You are absolutely right. This is unprecedented. The Commerce Department has never implemented anything of this size, and I take that responsibility incredibly seriously. I have a job to achieve national security goals and to protect taxpayer money, and we aim to do both, to be a steward of taxpayer money. We are building a team. Since the time the bill passed, we have built a team of about 150 professionals. I would invite you to meet them anytime. They are incredibly talented people, and we are building a risk team specifically devoted to the issues that you highlight.

The Risk Team is of risk professionals to make sure we are evaluating all the risk, and also after we put the money out, to make sure that the companies are doing what they said they would do. Also, we don't plan to put the money out to these companies in one lump sum, we plan to put it out on milestone-based achievement. So some money, see what they do.

So we are going to be massively transparent, provide notice, as we are required to do to Congress, for investments of $10 million or more, and have—we are doing an incredible amount of due diligence, all of which will be documented. And as I said, have a whole team devoted to management of risk and compliance of the companies to the promises that they make us in exchange for the money.

Senator FISCHER. In this report, were there any patterns that emerged? You know, when you see that increase in fraud, were there any patterns, anything specific that companies may be doing that would be red flags to be able to help this risk team to be able to identify them at an earlier time?

Secretary RAIMONDO. Yes. It is a great question. And of course, something that we are obsessed with, always trying to get better? No, not particularly. As was said earlier, look, putting $50 billion of taxpayer money out in partnership with private sector companies is a challenge. And so I don't think there is any one answer. I can simply tell you the team we have is built with professionals that have 10, 20, 30 years of experience in track record. We are building new systems, whole new systems of due diligence, compliance.

Every company, for example, will have to give us a security plan, an R&D plan, a financial plan, open their books to us, share their finances with us, and we will use all of that information to hold them accountable.

Senator FISCHER. You mentioned that you are putting money out, like first payments, second payments to be able to——

Secretary RAIMONDO. Exactly.

Senator FISCHER.—to be able to keep track of it easier. If you would see anything that was questionable there, can you cancel grants?

Secretary RAIMONDO. Yes. Yes. We could claw back money, depending on the situation. Like, for example, if they violated the China Guardrails, or we could—we would not fund the next tranche if they didn't meet the conditions that were required.

Senator FISCHER. Right. I would be negligent if I didn't put in a plug for Nebraska as well, since we are going down the dais here to be able to get a plug in for Nebraska, and the good things that we see. I do have a question, though, on how do you define what a region is?

And then also, Dr. Panch, if you could say nice things about my state.

[Laughing].

Senator FISCHER. Look it up.

Dr. PANCHANATHAN. Yes, we have it. Ready to go whenever you are.

Senator FISCHER. So how do you define a region?

Secretary RAIMONDO. Well, for the tech hubs, we have to have several awardees within each of the EDA's regions. So the Economic Development Agency has, statutorily, several regions around the country, and we have to have some tech hubs in each region.

Dr. PANCHANATHAN. So Senator, first of all, NSF had, of this investment that was made of CHIPS and Science, NSF got $200 million over 5 years. The science portion of NSF's is still an authorization, not an appropriation. We are hoping that we will have the in-

vestment that is planned, and the authorizations to become appropriations, but we are not waiting for that to energize the innovation all across the nation, as you heard, that I mentioned that.

The $200 million is being used in order to be able to generate the 100,000 semiconductor technicians, workers, researchers that our Nation needs very rapidly. The Secretary talked about what we need by 2030, but it is about the fact that it is even beyond 2030. So NSF is working toward that. And for partnership, again, to your earlier question, public-private partnerships, we are working with the consortium of companies, Micron, Intel, Samsung, Ericsson, and others.

To the state of Nebraska, since you asked. So we are very thrilled, again, NSF's investments span all parts of our nation, energizing community colleges, universities, and so on. Let me give you a couple of examples from Nebraska. So the University of Nebraska, EPSCoR, or to track one award, which is $20 million for the period of 2021–2026, is participating in the second quantum revolution by launching an interdisciplinary, interdepartmental, and multi-campus research and education cluster focused on Emergent Quantum Materials and Technologies, called EQUATE, this essentially to increase the jurisdiction's competitiveness in the area of quantum science and technologies, as one example.

There is another project, again, which we have an award to the University of Nebraska-Lincoln, which is a companion to the Large Hadron Collider work that is happening. So here we are essentially supporting a CMS detector and supporting software being developed at the University of Nebraska.

So clearly, again, I want to reemphasize this point, you are going to tire of me saying this: Talent and ideas are everywhere, and it is our responsibility to find them, nurture them, motivate them, and bring them to life. That is the only way we are going to outcompete other nations.

Senator FISCHER. Thank you. There is no place like Nebraska. Thank you. Thank you, Madam Chair.

The CHAIR. Senator Hickenlooper, I am going to ask you to chair while I run and vote. And then, following you will be Senator Moran.

STATEMENT OF HON. JOHN HICKENLOOPER,
U.S. SENATOR FROM COLORADO

Senator HICKENLOOPER. And Senator Fischer, I will put in a plug for Nebraska as well, but only after I put in a plug for Colorado.

Thank you, Madam Chair. And it is great to see such a crowd here. I feel a little bit like we are at Sunday Night Football with Taylor Swift and Travis Kelce. I haven't seen this many people in this room in quite a while. But Dr. Panchanathan, I know that you attract a crowd, and that you have really devoted yourself to these issues.

And Secretary Raimondo, just for you, other Senators should know that we were—we overlapped as Governors, and I don't think there is another Governor that had as strong bipartisan support, because she made decisions not from a political perspective, but what is the best outcome. And she stole our best ideas. We stole her best ideas. That is sort of the way the Governor's world works.

So we will start with you, Secretary Raimondo. As a former Governor, I appreciate the recognition in your Department that innovation and workforce development thrive when local communities have an active seat, not just a seat, but an active seat at the table. And we have been listening to the needs of our communities, and I think Colorado has positioned itself as a leader in startup creation, and supporting entrepreneurs, generating a diverse workforce in a range of technology fields, advanced manufacturing, cybersecurity, clean energy, quantum.

So I don't have to go on. I think the other Senators have done a good job of pitching their states. I don't have to go on in either of these questions, regional hubs, or the regional innovation engines, why Colorado is so well-suited. But I do think, I would like to ask both of you to describe how the Department and NSF, how will you coordinate complementary regional tech hubs and regional innovation engines?

Dr. PANCHANATHAN. Senator, let me start. Even before the CHIPS and Science Act, Secretary Raimondo and I, as soon as she took office, we spoke the very next week and said that we are going to hyper-partner, if there is a term like that, because we believe that this is in the interest of our nation, of the taxpayers who invest in both our agencies and departments. So we have been—at NSF, in fact, we have a CHIPS Steering Committee, which is the Office of the Director, that works almost on a daily basis, and a weekly basis of synchronization with the Secretary's Office and their Steering Committee.

So every program that the Secretary talked about, you know, the National Science and Technology Centers, the workforce development activities, the EDA activities, the Regional Technology Hubs, every one of those activities are highly coordinated. In fact, when the Regional Technology Hubs' announcement was being made, even the verbiage of the announcement was coordinated between NSF and Commerce, and vice versa.

So that is the level of coordination we have because we believe that we don't want to lose any of these innovations and innovators by having any of these valleys of death, as we call them. So we are making sure that we are tightening those gaps so that we can carry the innovation all the way from fundamental research to applied translational work, to then into the innovation outcomes that we seek.

Secretary RAIMONDO. Just one quick addition to that, and I agree, and it was very, very well said. Everyone knows, if you talk to industry and academia, everyone will tell you, NSF's job training programs are, you know, world-class, the curriculum, the approach. So we want to learn from that and then, of course, expand it because we now have all of this additional money.

But in the NSTC, for example, which we are going to establish this fall, NSF is a founding member of that. So we are really trying to bake in the NSF to everything we do and, frankly, leverage all of their great work, especially around workforce training.

Senator HICKENLOOPER. You are way ahead of us, and that is very, very encouraging.

Gina, Secretary Raimondo, the CHIPS and for Science directs the Office of Science and Technology Policy to develop the Interagency

National Science and Technology Strategy to establish national research goals, especially in terms of emerging technologies. And we have been looking at how research, and standards, new commercial applications in the field of AI, are going to transform, not just our economy, but our global competitiveness. So I thought it would be useful just to get what priorities does the Department see are important in this kind of forthcoming strategy to reflect in the field of AI?

Secretary RAIMONDO. So we should visit on this when we have more than 19 seconds to talk about it. But NIST, as you well know, NIST is the standard-setting body. They are kind of the lead agency now in the Administration's work on AI. They have already put out their Risk Management Framework, which is voluntary risk guides for developers developing AI. And the special sauce of NIST is that, because they are a neutral third party, everyone trusts them. So industry will collaborate with them, universities will collaborate with them. And that is the entity that will be forming the new standards.

And you know, candidly, I know I am out of time. I think, you know, there will be a U.S.-led ecosystem, and we need—of AI, we lead the world, and we need to make sure that the standards that fuel that are consistent with our democratic values. So we can have a further discussion.

Senator HICKENLOOPER. No, absolutely. And I agree completely. And I think NIST, just to our large audience, I think NIST is one of the most effective organizations we have in the Government. I think they do a remarkable job at an almost impossible job. I mean, the remarkable success at an almost impossible job. All right, I will yield. But I get to ask questions later because now I am chairing, so I will get to come back.

Senator Thune.

Senator THUNE. Mr. Chair, I would yield to my colleague that is down, just to my right, Senator Moran, who has been waiting patiently.

Senator HICKENLOOPER. Senator Moran.

Senator THUNE. Very patiently, to ask questions.

STATEMENT OF HON. JERRY MORAN,
U.S. SENATOR FROM KANSAS

Senator MORAN. Thank you, Senator Thune, for yielding. And thank you to the Director and to the Secretary for your presence with us today and the work that you are doing to implement the Science and CHIPS Act.

I would not take up my time, very much of my time, anyway, to reiterate what has been said time and time again in regard to rural and small business. Thank you, Director. We might have a conversation in the future about, I am pleased with the EPSCoR, that you met the standard goal. I would be interested in knowing if there are challenges that you will face in continuing to meet that or exceed that goal in the future?

Secretary Raimondo, could you update the Committee on your efforts to ensure rural states and small businesses benefit from the CHIPS and Science Act, particularly via the Tech Hubs and CHIPS Program?

Secretary RAIMONDO. Yes, thank you, Senator. So as I said, we will be putting up the Tech Hub designations this fall, and we will ensure that there will be geographic representation, including rural representation. Much of that is because we have been doing outreach to rural communities to let them know the money exists. We want them to apply, and to help them apply. As I said before, it is so oversubscribed that I have no doubt there will be rural places we would have liked to have invested in that we won't be able to.

With the CHIPS part of it, just last week, we put out a funding opportunity for small and medium-sized supply chain companies. And I promise you, we are going to work overtime to have small suppliers, small chip companies eligible for the money.

Senator MORAN. You have reassured me of that at least 16 times, and I am thankful that it is still true today. Would you describe, Secretary, the process for evaluating tech hub applications and, in particular: What roles do the EDA regional offices play in that process?

Secretary RAIMONDO. So the EDA, it is, as I said before, it is a merit-based process. We have national security goals that we need to achieve, and those are primary. Another thing we evaluate is likelihood of success, how strong is the partnership, is there full buy-in from the community. The decisions are going to be made by a committee in D.C., with advice and consultation from the local offices.

Senator MORAN. Thank you. Regional offices?

Secretary RAIMONDO. Regional offices, yes.

Senator MORAN. Could you tell me, Secretary, if there is value in an application for a tech hub that originates by a state, the tech hub application originates by a state, as compared to an entity, a different entity?

Secretary RAIMONDO. I don't think that. There is no preference either way.

Senator MORAN. OK.

Secretary RAIMONDO. We are open.

Senator MORAN. The timeline for tech hub announcements, tech hub designees, and development grant awards.

Secretary RAIMONDO. This fall, as soon as possible.

Senator MORAN. Then, expect to see CHIPS Program Awards at what point in time?

Secretary RAIMONDO. Also this fall. Let me say this, I am moving as fast as I can, but it is more important to get it right than move fast. And it depends on companies applying and having good applications. Having said that, I hope tech hubs will be in the coming weeks, and I hope we will have some CHIPS funding announcements this fall.

Senator MORAN. Thank you for the explanation. And it is one with which I agree. Finally, I want to talk about Huawei, export controls on AI technology. Details about what they seem to have accomplished, what Huawei chips have—what Huawei has seemed to accomplish, the details of that remain unclear.

Secretary RAIMONDO. Mm-hmm.

Senator MORAN. We have a particular interest in our appropriations process in the Bureau of Industry and Security within your Department. There was a significant funding boost in Fiscal Year

2022—I am sorry—2023, I want to get to my question in the next few seconds that I have. What gaps remain in U.S. technology export restrictions that may have allowed a targeted company to manufacture an advanced semiconductor?

Secretary RAIMONDO. OK. This is a critical thing, and we should visit when we have more time. Let me just say, the reports about Huawei are incredibly disturbing. And although I can't comment on any investigations, I promise you we take every credible threat seriously and investigate to the fullest, wherever we think there is a credible allegation that a company has done an end run around our export controls.

We need different tools. I am supportive of the GUARD Act, which would—and RESTRICT Act, which would codify our ICTS authorities. We need that to have a comprehensive approach to go after connected apps. We would need resources, additionally, to do that. I think we need additional resources around enforcement to do exactly what you are talking about.

And, candidly, we need to—the threat is different today. The threat from China in 2023 is different than the Cold War threats of decades ago. It is technology, it is AI, it is moving fast. And so I would be—I would welcome a broader discussion with you around how we modernize what we do, and how we properly fund what we do.

Senator MORAN. There have been lots of wake-up calls. Huawei is a particular one that stands out, received significant attention. And I would welcome the chance for your direction, suggestion on how we, either as appropriators or authorizers, could be helpful in closing this opportunity for China's technology theft.

Secretary RAIMONDO. We will do it. I mean, I have to say I am proud of the fact that under my watch, we imposed the largest fine ever in history, a $300 million fine against a company called Seagate for violating export controls, selling to Huawei. So we are as tough as we need to be, but more resources would be helpful.

Senator MORAN. Was the fine collected?

Secretary RAIMONDO. Yes.

Senator MORAN. OK. Good. Thank you.

The CHAIR. Senator Luján.

STATEMENT OF HON. BEN RAY LUJÁN, U.S. SENATOR FROM NEW MEXICO

Senator LUJÁN. Thank you, Chair Cantwell. Thank you to the Ranking Member for this important hearing. Secretary, thank you for being here. Director, thank you for being here.

Secretary Raimondo, one thing I wanted to share with you, and also Chair Cantwell, is to show support for Ranking Member Cruz's question to the Secretary on mid-band spectrum and coordination between the Department of Commerce and Defense to ensure more mid-band spectrum is available for 5G Wireless.

So I don't have a question at this time. I only wanted to show support for the request from Senator Cruz and the commitment from the Secretary to brief Congress on the study that the Department of Defense submitted last week. So thank you very much for that.

As you know, I am proud of New Mexico's long history of connecting scientific innovation, national security, and global competitiveness, and for over 75 years, our Department of Energy National Labs have served the Nation with their international leadership in scientific discovery and innovation. Created through CHIPS and science, the NSF Innovation Engines are designed to create regional-scale innovation ecosystems across the Nation to accelerate the development of critical technologies. These Innovation Engines will provide another opportunity for states like New Mexico to support the Nation by driving the scientific innovation needed to maintain international leadership.

Director, I was pleased that your testimony acknowledged the fact that we all know too well. The economic prosperity produced through scientific innovation has not been shared equally across our Nation. My question, Director, yes or no, do you expect that the choice of Regional Innovation Engines will provide economic opportunities to those communities that are too often overlooked?

Dr. PANCHANATHAN. Yes. And I can give you many examples.

Senator LUJÁN. I appreciate that very much, and I will submit something to get those specific responses as well. I was happy to see that one of the 16 Innovation Engine finalists is the New Mexico Space Valley Coalition, which is dedicated to grow in the Nation's commercial space industry. But the New Mexico Space Valley Coalition includes the City of Albuquerque, leadership from the private industry, universities across the State of New Mexico, including Navajo Technical University.

Director, as you already know the coalition in New Mexico is an incredibly talented group that represents the diversity of my state, and the United States of America, by all measures, and the New Mexico Space Valley Coalition appears to be a perfect fit, for the innovation engine decision. The CHIPS and Science Act, established the technology innovation, and partnership directed at the National Science Foundation.

Of those three words, technology, innovation, and partnerships, partnership is very important, by expanding authorities for not just the National Science Foundation, but also the Departments of Energy and Commerce, the CHIPS and Science Act makes clear that no single department or agency can do it alone. The scientific challenges we face are too big, the time line to meet these challenges is too short, and the international competition is too strong. I was pleased to see that NSF, and the Department of Energy signed an MOU to partner on finding solutions to many of these challenges.

Director, yes or no. For the National Science Foundation to successfully implement the new authorities provided by CHIPS and Science, will the agency need partners like the Department of Energy?

Dr. PANCHANATHAN. Yes. And we do that in large measure with the MOU, and there are many examples again, of that too.

Senator LUJÁN. Can you share some of those examples that you just shared, through that MOU as well, but others that show that connection and the partnership with the Department of Energy?

Dr. PANCHANATHAN. We will be happy to do that, yes.

Senator LUJÁN. Now, Secretary Raimondo, thank you for your leadership and for leading the Department of Commerce, especially

in this space where so many of the challenges that we face as a country will fall under your leadership and the jurisdiction of the Department of Commerce and your team. We just heard from the Director how NSF is partnering with the Department of Energy. Can you share with the Committee how the Department of Commerce is engaging the Department of Energy and the National Labs in implementing CHIPS and Science?

Secretary RAIMONDO. Yes, thank you. We also have an excellent cooperation with the Department of Energy, and in particular in the National Science and Technology Center, which will stand up this fall. They, along with NSF, will be one of the founding entities, and so they will have a real role to play in establishing the center, defining the priorities, and you know, we plan to rely on their expertise very heavily.

Senator LUJÁN. I appreciate that very much. And, Madam Chair, as I yield back, I just want to note for the record a concern that I have, which is looking at the aggressive posture from the administration, solely for the National Science Foundation top line. I have a concern when I am looking at the top lines for NSF compared to the Department of Energy Office of Science. And I think that Congress and the administration need to expand funding for both NSF and the Office of Science at similar rates if we are going to work to make sure CHIPS truly succeeds as well. So with that, thank you, and I yield back.

The CHAIR. Thank you, Senator Thune.

STATEMENT OF HON. JOHN THUNE,
U.S. SENATOR FROM SOUTH DAKOTA

Senator THUNE. Thank you, Madam Chair. Secretary Raimondo, I thank you for being here today. I have been working with members of this committee on both sides of the aisle to develop a Light-Touch Framework for oversight of artificial intelligence. And as I am sure you are aware, AI is a major focus for the Senate.

In your written testimony, you indicated that the CHIPS and Science Act will help enable us to be the global leader in emerging technologies, and you specifically referenced the new National Semiconductor Technology Center. I am focused on ensuring that the Senate puts the necessary guardrails in place while also ensuring that any legislation encourages and not stifles innovation in AI.

So could you explain in more detail how the National Semiconductor Technology Center, and the CHIPS and Science Act, more broadly, is encouraging innovation in artificial intelligence?

Secretary RAIMONDO. Thank you. I agree with you strongly. The United States has a competitive edge in the world right now. We are leading the world in AI, and we need to preserve that lead and extend that lead, and so we have to preserve our competitive edge; having said that, we have to balance the opportunity with guardrails that make sure that we protect ourselves from the downsides.

So NIST, part of the Department of Commerce, has put out a Risk Management Framework, which is voluntary, to developers for safeguards they should use as they develop new AI algorithms, similar to the voluntary commitments that the President and the administration have extracted from the biggest AI developers.

With respect to the NSTC, that will be research and development. So whether it is new materials, new ways to develop new semiconductor chips, right, all AI is going to be powered by AI chips, where, again, we lead the world. I think the NSTC will have collaborations with universities and companies to lead the next wave of research and development and startups, so we continue to maintain our AI lead.

Senator THUNE. Thanks. This Administration continues to push for public utility-style regulations on the internet. USDA has tried to insert so-called "net neutrality rules" in its reconnect program, NTIA, has thrown in a number of extraneous requirements in the BEAD Program. And just last week, the FCC announced that it will be reinstating the Obama-era Title II Regulations on the internet. Don't ask me why you would want to regulate the Internet as a depression-era monopoly, but they seem to be headed back down that road.

With respect to the BEAD Program, I find it troubling that the administration would put over $40 billion in broadband funding at risk just to accomplish a campaign talking point. And what I would argue is that instead, we should be establishing efficient BEAD rules that incentivize the participation of companies that have spent years building out reliable networks to some of the most remote parts of the country.

Will you commit to not require states to include specific price points for broadband offerings in their BEAD plans; yes or no?

Secretary RAIMONDO. Yes. We do not require that. I want to be clear. We are not rate-regulating. We are not price-setting. And we are not requiring states to do that. Furthermore, we want all providers, large and small, to participate in the program. The way we are doing it is every state, you know, your state, your Governor, would create a plan that they think could meet the needs of your state. And then our job would be to evaluate that before we fund the plan.

Senator THUNE. All right, so you would commit that NTIA will give states discretion on how to implement——

Secretary RAIMONDO. Yes.

Senator THUNE.—their low-cost and middle-class affordability requirements? In 2022 I introduced the Quantum Network Infrastructure and Workforce Development Act with Senator Hassan, which was ultimately enacted as part of the CHIPS and Science Act. And among other things, the bill asks to build on the expertise of NIST to improve existing research on quantum networking and encryption. These applications have the potential to greatly enhance network security and protect privacy while bolstering U.S. leadership and competitiveness in the development of these technologies.

Could you describe how the Department has worked to promote U.S. competitiveness and innovation in the development and standardization of quantum technologies, including through the implementation of this bill?

Secretary RAIMONDO. I would be happy to, and I will follow up with Dr. Locascio, who runs NIST. But I can tell you that quantum as—quantum, AI, and chips are areas where we are exceedingly focused to develop standards, and to focus our investments.

Senator THUNE. All right. Thank you. Thank you, Madam Chair.
The CHAIR. Thank you. Senator Peters.

STATEMENT OF HON. GARY PETERS,
U.S. SENATOR FROM MICHIGAN

Senator PETERS. Thank you, Madam Chair. And to our witnesses, welcome, it is good to see both of you here. And thank you for all the great work that you do.

Secretary Raimondo, I believe, in order to be a great country that you actually have to make things. And it has to be our focus. You and I have talked about that before. And one of the primary goals of the CHIPS and Science Act was to increase domestic production of mature semiconductor chips to address the crisis that we saw in the automotive supply chain. A crisis that was preventing consumers from being able to purchase vehicles and resulted in furloughs of auto workers due to the shortage of mature chips; like we had parking lots full of automobiles, and pickup trucks, and other vehicles that just needed a chip or two before they could head off to the dealer.

Your Department has pledged to spend $10 billion in the CHIPS funding to fix that, and certainly, I would love to have an update on that, but hope that your commitment will stand through the full expenditure of that necessary investment in that industry. But in addition to making more mature chips here in America, we must also use the CHIPS and Science Act to invest in the future of the automotive industry, and that means research and development.

Michigan stakeholders have already mobilized to meet that challenge, and one example is the STAR Initiative to establish a Semiconductor Center of Excellence in Michigan, led by the internationally renowned research center, IMEC, semiconductor equipment manufacturer KLA, the University of Michigan, and Washington Community College.

The STAR Initiative will focus on advanced microelectronic research for vehicle electrification, and autonomous automotive solutions. These innovative solutions will help cement the United States' leadership, not only in the future of semiconductors, but also in the future of the automotive industry.

So my question for you, Secretary Raimondo, as you disseminate CHIPS R&D funding in the coming months, will you commit to considering the crossover impacts that semiconductor R&D projects can have on other industries, like the automotive industry, as a way to maximize the impact of these funds?

Secretary RAIMONDO. I will. But let me say this. As you know, the statute—as you well know, the statute requires a $2 billion set aside for the mature node chips, and we have said that we believe we will invest closer to $10 billion in supply chains, mature and current node chips, and that is still our plan. So we think that is what is necessary to get the job done.

With respect to your other question, early in the new year, we will be getting the NOFO out, the Funding Opportunity out for the R&D portion, and I will commit, certainly, to work with you between now and then as we design that application before putting it out early in the new year. But I do want to be clear, and I have said this all along, the point of the CHIPS Program isn't just to

incentivize a few new fabs and call it a day, right. That is not enough. That is not success. That is necessary but insufficient.

The point is to do exactly as you say. It is to stimulate research and development, it is to stimulate job training, and to have a whole ecosystem that no longer—that we need to deepen in the United States, including applications like in the auto industry. So we are in violent agreement on this, and you know I look forward to working with you.

Senator PETERS. Very good. Well, I will look forward to that as well. I will raise another issue related to semiconductors, and that is advanced packaging, which is a significant part of the chip supply chain, as you well know, that I believe needs significant focus as part of our onshoring efforts, to bring this back to the United States, because of its importance both from a national security perspective and for American workers and consumers.

Calumet Electronics in Calumet, Michigan, with the help of incredible engineers from the Michigan Technological University up in Houghton, is doing incredible work on advanced packaging, particularly by making very advanced printed circuit boards for defense applications, and they are expanding their capacity.

My question for you is, as we try to ensure the supply chain is supported, can you speak to how advanced packaging will be prioritized in funding going forward?

Secretary RAIMONDO. Yes. This fall we will be putting out a strategy paper on our packaging strategy, our plan, so you will be able to see that soon. But let me tell you this, right now, we don't really do advanced packaging in the United States. It is a huge problem that doesn't get much attention. Even if we make the chips in the United States and then ship them to Asia to be packaged, that doesn't secure, you know, doesn't align with our national security goals.

So we are deeply committed, at the end of this implementation, to have advanced packaging on our shores. And, as I say, later this year, we will put out more details on the strategy.

The CHAIR. Senator Blackburn.

STATEMENT OF HON. MARSHA BLACKBURN,
U.S. SENATOR FROM TENNESSEE

Senator BLACKBURN. Thank you, Madame Chairman. Let me stay with this issue on the fabs, and I had looked at your Notice of Funding Opportunity when you were talking about we could have as many fabs as we want, and how we have to move forward on this with the supply chain. So my question for you is, looking at the Investment Tax Credit, and should Congress look at harmonizing the Investment Tax Credit in 48D to align with the program that you are running to ensure that the law allows for manufacturing for the facilities that you claim are going to be necessary, and for being able to reshore much of that activity? And then how are you working with Secretary Yellen on this?

Secretary RAIMONDO. So you know, I will leave it to Congress to decide if and how you might want to amend the legislation. The legislation, as currently crafted, has the tax credit being more restrictive than the CHIPS Act—excuse me—than the grant, so it is

intended by statute, that the tax credit is more restrictive than the grant program.

Senator BLACKBURN. Yes, my question is, should we harmonize that?

Secretary RAIMONDO. I would have to think about that, to be very honest.

Senator BLACKBURN. OK. If you want to get back to me on that, I think your insight on this is something that is important.

Secretary RAIMONDO. OK.

Senator BLACKBURN. Dr. Panch, again, we almost got you into a UT jersey when you were there in Tennessee, and we will get you back. Let us talk a little bit about microelectronics and ultraviolet lithography, and the work that is being done there. What are you doing to make certain that we don't have several different agencies that are working on this, but we are not harmonizing that work?

Dr. PANCHANATHAN. Senator, it was great to be with you at the University of Tennessee in Knoxville, where we announced the Regional Innovation Engine, which I keep talking about. This was focused on transportation electrification and digitization. And specifically to your question, we have very tight partnerships with all of the agencies in topical areas that bring us together. For example, we have an MOU with the Department of——

Senator BLACKBURN. So you are watching the duplication?

Dr. PANCHANATHAN. Absolutely. Absolutely.

Senator BLACKBURN. Perfect. That is what I wanted to hear. And I know people in Tennessee wanted to know that.

Secretary, I want to talk a little bit about your trip to China. Did you think it was a success?

Secretary RAIMONDO. It was a productive trip, certainly.

Senator BLACKBURN. Were you able to hold them to account?

Secretary RAIMONDO. I was clear that there will be no negotiation on anything related to national security or export controls.

Senator BLACKBURN. And did you call them out about committing genocide against the Uyghur Muslims?

Secretary RAIMONDO. I did.

Senator BLACKBURN. And their response?

Secretary RAIMONDO. I didn't get much of a response.

Senator BLACKBURN. OK. And have you visited Taiwan?

Secretary RAIMONDO. I have not.

Senator BLACKBURN. Any reason for that?

Secretary RAIMONDO. I have had no reason to visit Taiwan.

Senator BLACKBURN. No reason to visit Taiwan? And even though they are a primary supplier of a lot of chips? Do you consider Taiwan a country?

Secretary RAIMONDO. The administration's policy is clear on Taiwan, and——

Senator BLACKBURN. So you are not going to deviate from that?

Secretary RAIMONDO. Absolutely not.

Senator BLACKBURN. OK. All right. I think that we are all very concerned about continuing to bolster our leadership, whether it is going to deal with semiconductors, broadband, AI, quantum, the microelectronics that we were just discussing. And we cannot afford to fall behind the CCP. We just can't. And it is going to take calling them out on this and holding them to account.

And, in my opinion, it is going to take supporting Taiwan and the work that they are doing. And, of course, you know, we have got to make certain that the CCP-controlled entities don't benefit as we move forward implementing CHIPS. And I think it is also Madam Chairman, one of the reasons that we have got to get busy with the NQIA and make certain that we get that reauthorized this year.

And I had read the article in *The Hill* where they mentioned that quantum computing capabilities are things that the Chinese Communist Party is going to use to bolster their surveillance and their satellite movements. And as you look at this, it is imperative that we not give them one inch. And I think that sending that message that, yes, indeed, Taiwan is someone we can work with, and they want to have our business is something that is important.

Thank you, Madam Chair.

The CHAIR. Thank you. Senator Welch. And I will just ask members we——

STATEMENT OF HON. PETER WELCH,
U.S. SENATOR FROM VERMONT

Senator WELCH. First of all——

The CHAIR.—we are on a tight time frame with some—with our witnesses, and we want to get through everybody, so just keep to your time if you can.

Senator WELCH. And I will. Secretary Raimondo, first of all, I think you are doing a great job, and we are excited in Vermont about the CHIPS Act, and I thank my colleague, Todd Young, who played such an instrumental role in getting that passed. We have real production of gallium nitride chips, printed on silicon chips, and that is a new technology that is providing greater power.

GlobalFoundries, which is a very large company in Vermont is a leader in this. And I want to give you an opportunity to explain what the Department is doing to continue to incentivize the development and the manufacture of mature legacy node semiconductor technology?

Secretary RAIMONDO. Yes, thank you, Senator; nice to see you. As I said, we—the statute requires that we invest at least $2 billion in grants in legacy nodes. We believe that we will invest significantly more than that because these are the CHIPS that are essential. I will say we have also executed an MOU with the Department of Defense, whereby they can share information with us around their needs for the defense industrial base. Much, if not most of the defense industrial base needs these existing node, mature node, and legacy chips. So that is another reason why we are so focused on making sure we have enough supply in the United States.

Senator WELCH. Thank you. Another question of real interest to us in Vermont, the Regional Tech Hubs Program that, of course, as you know was part of CHIPS and Science. We have got applicants. And is there a commitment from the EDA and the Department of Commerce to follow the requirements in that program around rural and EPSCoR states, and that Vermont would be among them?

Secretary RAIMONDO. Yes, of course.

Senator WELCH. And the deadline for Phase I solicitations was August 15, and there is a lot of interest in knowing when we are going to hear. And I don't know if you can comment on that, but it would be good to have some visibility on when we can expect an answer.

Secretary RAIMONDO. Yes, Senator. As I said earlier, we are working as fast as we can. We have received over 400 applications from nearly every state. I hope to be able to have news in the next month, or so.

Senator WELCH. OK. Thank you very much.

And I wanted to ask Dr. Panchanathan a few questions. We really appreciate all that the Act is doing, and you are doing to help clean energy innovators from the development stage all the way through commercialization. And all of us are a little bit blue about how we developed solar but then we lost commercialization to China. So I want to give you an opportunity to express what you are doing to ensure that the Directorate of Technology is bringing clean energy technologies from the research phase to the commercialization phase in the U.S.?

Dr. PANCHANATHAN. Thank you very much, Senator Welch, for the opportunity to weigh in on this. In May of this year, we announced the first-ever NSF Engines Development Awards, which I talked about, seven of those awards include sustainable energy as a topic area. In August, we announced 16 NSF Engine finalist proposals. Two of those include the topic areas of sustainable energy.

In addition, to that, many of our existing programs that in the translation phase, in terms of what you refer to as starting—resulting in startups or small companies being invested in, SBIR and STTR programs have also got significant clean energy portfolios as well.

So as an example, the Vermont startup, Rich Earth, LLC, is aiming to leverage clean energy technologies while in the process of optimizing wastewater treatment for nutrient and water recovery, so TIP has also launched the Accelerating Research Translation Program, so there is a number of those activities that is focused on clean energy and sustainable energy. So I hope that answers your question.

Senator WELCH. OK. Thank you. I want to stay within the Chair's concern. And I just want to make a comment about working with us on the letter of credit that is going to hammer us if it stays at its current level in the BEAD Program.

Madam Chair, I yield back.

The CHAIR. Thank you. Senator Vance.

STATEMENT OF HON. J. D. VANCE,
U.S. SENATOR FROM OHIO

Senator VANCE. Thanks, Madam Chair. Thanks, Secretary Raimondo, and the witness for being here. I appreciate it. I want to say or at least echo some of the comments that colleagues from across the aisle have made of my colleague Senator Young, and some of the great works done on the CHIPS Act. I, of course, wasn't here when the CHIPS Act was passed, but I certainly would have supported it because I think it is important to bring American

manufacturing, especially in high-technology industries, back to our country.

There have been many stories and many questions raised since the CHIPS Act was passed, about its implementation and also how companies are benefiting or not from some of its resources. I want to focus on one particular barrier, just to start out with, Secretary Raimondo, which is the labor shortage. You hear a lot from folks who are working in the chip industry that we have a labor shortage. You hear this, of course, from Taiwan Semiconductor, which has tried to build a $40 billion facility in Arizona and is effectively trying to import skilled engineers from Taiwan because they say they can't get the labor from here.

Is that an accurate assessment of the situation, that we have, of course, the need to produce chips in America, but we also have a shortage of skilled labor, and recruiting the people to actually make those chips?

Secretary RAIMONDO. Yes, it is. Listen, I think, and as we have said, we will be using some of the CHIPS Act to devote to labor and training and workforce. And in fact, since the passage of the bill, over 50 community colleges have started new initiatives to train people. But there is no question, we think we will create about a half a million jobs, at least, through the implementation, and we need to do more to train people for that.

Senator VANCE. So being mindful of time, Secretary Raimondo.

Secretary RAIMONDO. Yes, sorry.

Senator VANCE. I want to point to a particular set of implementation criteria that, in light of the admitted labor shortage, gives me some concern. So one of the administrative directives says that applicants to CHIPS funding must, quote, "Develop an equity strategy in concert with their partners to create equitable workforce pathways for economically disadvantaged individuals in their region"; additionally, applicants must recruit from diverse sources of talent and, quote, "Set and publicly communicate goals for workplace diversity."

Now, I note, of course, that creating these diversity mandates within a company actually requires additional costs. You have to hire diversity consultants. You have to hire additional human resources people. And so I guess I am struggling to make sense of the fact that we apparently have a shortage of skilled labor to manufacture chips on the one hand, and yet the Secretary of Commerce is telling people that they can only hire the people who check the right diversity boxes. That doesn't make a ton of sense, and it seems to be counterproductive to the goal of bringing this industry back to the United States in the first place.

Secretary RAIMONDO. So first of all, there are no mandates. Second of all, is it completely consistent——

Senator VANCE. What would you call it, Secretary with—Secretary Raimondo, when the Secretary of Commerce says: You must do this in order to receive funding; if it is not a mandate, what is it?

Secretary RAIMONDO. What is it that we are telling them they have to show us a workforce plan, and we need to evaluate that plan.

Senator VANCE. They have to show us a workforce plan in order to receive money from the Federal Government——

Secretary RAIMONDO. Absolutely.

Senator VANCE.—and that is the definition of a mandate. You must do X in order to receive Y dollars.

Secretary RAIMONDO. The mandate is——

Senator VANCE. Let me make this point, Secretary Raimondo; look, think about this from the perspective of a company that is thinking about locating a chip fabrication facility in this country or in China. From China, they get cheap labor, massive subsidies, and a government that seems to want to work with them. From the United States, they get a little bit of money and a human resources statement that looks like it was written by a 22-year-old gender studies graduate of Harvard or Yale, which, let us be honest, it probably was written by a 22-year-old gender studies graduate of Harvard or Yale.

Why would you locate your facility in the United States of America when you get a human resources lecture from us, but from China, you get a whole lot of money and a whole lot of facilitation for your business? What is the market economy here? Is it the economy that makes it hard to do business or easier to do business? I am curious. Where would you locate the facility given those two separate sets of criteria?

Secretary RAIMONDO. Sir, before I went to China, I talked to about 120 CEOs of U.S. businesses, and they all told me that China is becoming increasingly uninvestable. I think there is no doubt that I would locate my business in the United States.

Senator VANCE. I agree with you, and I agree these companies should locate their business in the United States. But we have to be careful. The reason that China has become uninvestable is because it is very, very hard to get our money out. But if we make it harder to do business, and if we pass bipartisan legislation that puts money into American manufacturing and then we make it harder to access it unless you check the diversity box, we are going to be extremely counterproductive.

I am mindful that I am at the end of my time. The last point that I would make, Secretary Raimondo, the United States, thank God, does not have a Chief Diversity Officer. I would appreciate it if the Biden Administration didn't pretend to be one. Thank you.

Secretary RAIMONDO. My job is to protect taxpayer money, and in order to do that, these companies have to be able to meet their mission, and in order to do that, they need to have a trained workforce, and I am going to work with them to make sure that happens.

Senator VANCE. I don't think diversity mandates are part of that.

The CHAIR. Senator Rosen.

Senator VANCE. Thank you, Madam Secretary.

The CHAIR. Senator Rosen.

STATEMENT OF HON. JACKY ROSEN,
U.S. SENATOR FROM NEVADA

Senator ROSEN. Thank you, Madam Chair. I appreciate it. And thank you for holding this important hearing. And Secretary

Raimondo, Director Panchanathan, thank you for your testimony today. I really appreciate it.

I want to take a moment to recognize the work that Secretary Raimondo, and Director Panchanathan have done to implement the CHIPS and Science Act. You have half built a team that has gone above and beyond, to quickly and efficiently roll out these programs so that we can strengthen our STEM workforce and bring good-paying jobs right here at home. To everyone's point, that is what we want.

And so we have talked a lot about advanced manufacturing, of course, we passed the CHIPS and Science Act, we have all been talking about this. We want to bring manufacturing back to America. We want to create those good-paying jobs here. And as we do this, again, everyone is talking about creating the workforce with the training and skills that are necessary. I am proud to support that bill, and I am proud that it included language that I drafted with Senator Blackburn to provide funding, workforce education, training, and development in advanced manufacturing. And this provision was based on my bipartisan Advanced Manufacturing Jobs in America Act.

So Director, can you please provide us an update on the implementation of the workforce provision?

And then, Secretary Raimondo, can you talk a little bit after that about how we include our smaller communities and our rural communities in being sure that they can grow in advanced manufacturing?

Dr. PANCHANATHAN. Thank you very much, Senator. Again, I want to say it was a pleasure being in Reno, Nevada, announcing the Regional Innovation Engine there. And I will come to that in a moment. To answer your question, NSF received $200 million over 5 years to establish workforce development plans focused on microelectronics. But as you know, NSF is the STEM workforce development agency for the country in all aspects of science, technology, engineering, and mathematics, in terms of the broad-based mandate which focuses on K–12, as well as university, community colleges, and beyond.

So this $25 million investment in Fiscal Year 2023 and Fiscal Year 2024 is focused on bringing up, as I said earlier, training upwards of 100,000 new semiconductor researchers, practitioners, technicians, and educators, fulfilling a key need of the semiconductor industry through Fiscal Year 2027 and beyond. So our funds have been used, primarily, in the partnerships that we have had with Intel and Micron to scale it, as well as the future of semiconductors program, as well as computer science for U.S. program, and specifically focused on microelectronic and semiconductor workforce development.

I am happy to talk more about this. In the interest of time, I just want to make sure that I am respectful of the overall time constraints that the Chair talked about. But I am happy to say that in Reno, Nevada, we are involving the Truckee Meadows Community College in training the talent toward lithium mining, processing, as well as recycling. Thank you.

Senator ROSEN. That is great. I have a lot to talk about there, and we love our community colleges in Nevada.

Secretary RAIMONDO. Nice to see you, Senator. Just to briefly add on to what Panch said. Last Friday, we put out an additional funding application for small suppliers. Additionally, as I have said earlier today, we are committed to investing in or providing grants to small, medium, and large semiconductor companies. In fact, as we have talked about, the United States lost about 25 percent of its small manufacturers in the past 25 years. Many of them are specialty chemical companies or material companies. And so, we are very much interested to partner with these companies in the CHIPS program to build out the entire supply chain all over the United States.

Senator ROSEN. Well, Secretary Raimondo, I am going to just—I know I have a minute left, so I am going to be very quick. I want to build on this, in the rural areas and in the mining areas that Director talked about too. I am a member of the Senate Armed Services Committee. We are thinking a lot about the national security implications of our critical mineral supply chains. This state's minerals are in the ground in rural Nevada. It is really important, we are the Nation's leader in hard rock mining and battery recycling, and so, talking about our workforce, talking about all the things we can do, what more can Congress do to bolster our critical minerals workforce, strengthen our supply chain, and of course, for us, that is really going to help our small and rural communities in Nevada?

Secretary RAIMONDO. I think we need to continue to focus on it. We need a comprehensive national plan as it relates to critical minerals, which is essential for electric vehicles and semiconductors. We, at the Commerce Department, are trying to build and have asked for, I think, $20 million to set up a supply chain office in the Commerce Department so we can be proactive, not just reactive, in identifying all of our holes.

Senator ROSEN. Well, thank you. I look forward to working on that.

Madam Chair, I made it with just right about on time. Thank you so much.

The CHAIR. Thank you. Senator Schmitt.

STATEMENT OF HON. ERIC SCHMITT,
U.S. SENATOR FROM MISSOURI

Senator SCHMITT. Thank you, Madam Chair. Welcome. Good to see you. I want to get to just two or three topics, so I will go kind of quickly. But as you know, the DoD is in the process of evaluating commercial 5G use, and Madam Secretary, in use in the lower 3. It is my understanding they have issued a report, they have talked to you about it, they have shared it with you, and also the NTIA, and there is a lot of hesitancy, I think, for a variety of reasons from other agencies—for a variety of reasons, of making additional spectrum available for commercial use.

It is finite. So I think the collaboration is really important, and you play an important role in advising the President on this, as you know, and understanding what our Nation's Spectrum Strategy ought to be, and what additional Federal spectrum available for commercial use, whether it is licensed shared, licensed, or unlicensed, what that ought to be. So it is critical, I think, that you

know, I serve on the Armed Services Committee, too, in addition to this committee, so there is a balancing act here, right? Not just national security, but obviously economic security. What are you doing, specifically, to have or evaluate a strategy here, and what would you do tomorrow if DoD says the lower 3 are off limits entirely?

Secretary RAIMONDO. I think that would be deeply problematic. As we said earlier, we received the report at the end of last week, and we should arrange a briefing for the DoD and NTIA to come to provide that briefing on what their report said. It is a balance, but economic competitiveness is national security, and making sure we have enough spectrum available for private sector innovation and 5G expansion is national security.

And there are ways, if we are innovative, this shouldn't be a zero-sum game. We can make more spectrum available, and also not take anything away from the DoD that they need to fulfill their mission.

Senator SCHMITT. Madam Secretary, in August, you visited China, shortly after it was revealed that the PRC had hacked your e-mail account. And they were privy to all of your e-mails. In an interview with CNN State of the Union, you argued that you were firm and direct about the hack with the Chinese counterparts. Do you think they viewed your visit as a sign of weakness?

Secretary RAIMONDO. I do not.

Senator SCHMITT. OK. Are you aware of additional Cabinet members that you were e-mailing with that they were able to access your e-mails from?

Secretary RAIMONDO. As you know, Senator, this is an active investigation, so I don't want to go into that in this public forum.

Senator SCHMITT. Obviously, this is concerning, right?

Secretary RAIMONDO. No doubt. The hack was concerning, it was unacceptable. I brought it up when I was there. It is more than concerning.

Senator SCHMITT. OK. I just want to switch things up a little bit with the remaining time that I have. As it relates to the BEAD Program, Senator Vance asked a couple of questions in this regard. What does climate change have to do with broadband?

Secretary RAIMONDO. Climate change has to do with everything. Tell me your exact question.

Senator SCHMITT. Well, I will be happy to. You ask, you have climate change requirements, and that the NOFO states: Eligible entities must account not only for current climate-related risks but also for how the frequency, severity, and nature of these extreme events may plausibly evolve as our climate continues to change over the coming decades.

Secretary RAIMONDO. Yes.

Senator SCHMITT. Can you tell me anywhere, anywhere though, Madam Secretary, anywhere, where Congress has put into law that you would require them to mitigate climate change? Can you point to that section?

Secretary RAIMONDO. Congress requires us to be good stewards of the taxpayer money and to be accountable——

Senator SCHMITT. That is not my question. Where are you drawing the authority from?

Secretary RAIMONDO [continuing]. And therefore we have to fund projects that will be successful; otherwise, we will waste money.

Senator SCHMITT. So I understand you might think it is important. I understand Joe Biden might think it is important. But Congress hasn't actually said that is a requirement.

Secretary RAIMONDO. But you want us to fund projects that will be successful, and if climate events prevent success for——

Senator SCHMITT. How does deploying broadband in Branson, Missouri, have anything to do with your climate agenda?

Secretary RAIMONDO. I will give you a great—well, no, but for example, Senator, I talk to people all the time, including in rural places, who tell me that due to climate events, their current technology doesn't work, like they don't have the Internet when there is a storm. So climate very definitely affects the effectiveness of certain technologies that provide the Internet to people.

Senator SCHMITT. OK. I can tell you—yes, I can tell you, having just been elected by a state with a large rural population; they are interested in their kids being able to access the Internet for homework. OK.

Secretary RAIMONDO. And that is the point that——

Senator SCHMITT. They are not interested in your social experiments, OK? So just in the line of Senator Vance's question about, you know; injecting identity politics into your applications, respectfully, how about we just deploy the broadband so people can access the internet?

Secretary RAIMONDO. Well, your state will receive $1.7 billion, and your Governor will be providing us with a plan for how he feels it should be invested.

The CHAIR. Senator Markey.

Senator SCHMITT. Thank you.

STATEMENT OF HON. EDWARD MARKEY,
U.S. SENATOR FROM MASSACHUSETTS

Senator MARKEY. Thank you. And you have two of my all-time favorite witnesses is here, so good to see you, Madam Secretary, and Panch. You know, you know you are somebody when you are a one-name wonder, like Beyonce, or Cher, or Bono.

[Laughter.]

Senator MARKEY. So with the explosive growth over the past two decades, the semiconductor industry is a large contributor to the climate crisis, releasing the equivalent annual emissions of 1.4 million cars on the roads of the United States. Carbon emissions and water consumption are particularly intense for the production of the most advanced CHIPS. As the Commerce Department prepares to issue $50 billion for chip manufacturing in R&D, we cannot ignore the environmental impact of this investment.

Secretary Raimondo, I was pleased to see that the Department of Commerce is requiring chip companies to submit climate and environmental responsibility plans in their applications for the CHIPS Act funds. So Madam Secretary, I understand that you are committing to ensuring that companies make good on their environmental commitments. Is that right?

Secretary RAIMONDO. Yes, and it isn't social policy. It is good business. Every CEO of every American company will tell you they

have to manage risk, and there is risk associated with climate events, and if we don't plan for those climate events, then they can insert risk into these projects, whether it is broadband or chips. So this is—companies ought to design projects to minimize adverse impacts to the project from climate and the environment. This is just good business and good taxpayer protection. It has nothing to do with the social agenda.

Senator MARKEY. Oh. Great. So major manufacturing activities, including chips manufacturing can also lead to significant environmental justice concerns for communities surrounding the manufacturing plants. Developing chips is an incredibly water, energy, and chemically intensive process. The chemicals currently used in semiconductor fabrication are extremely dangerous to workers, community members, and their families.

New technologies and processes are needed to manufacture semiconductors without these risks. So can you tell us how you are prioritizing that research so that it is truly green and clean in the semiconductor fabrication technologies?

Secretary RAIMONDO. Yes. So in addition to companies who are applying for taxpayer money, they have to show us a financial plan, an R&D plan, a security plan, and we want to see a sustainability plan that we can evaluate to make sure that they are serious about these commitments.

Senator MARKEY. Yes. So we are going to open the Federal taxpayers' wallets to private sector companies, but we can't do so and close our eyes to the potential environmental harm to the communities where they are going to be located. We can do both at the same time.

Now, I want to move to the environmental impact of chip manufacturer to the impact of chip use. So big data, machine learning, and AI all require huge numbers of chip cutting-edge semiconductors and create a significant environmental impact. A study from the University of Massachusetts Amherst estimated that the energy for developing one advanced AI algorithm out of millions of potential models of algorithms would emit as much CO_2 as five cars over the algorithm's lifetime, and that could be millions of algorithms that are out there.

Secretary RAIMONDO. Yes.

Senator MARKEY. So these data centers are using scarce water supplies across our country for cooling these chips. And while AI proponents argue that AI will solve most of our pressing problems, the energy required to power this technology is contributing to the biggest problem of them all, climate change. So can you talk about how you are integrating your thinking at Commerce on these issues as one solution to a set of problems could actually exacerbate another even larger set of problems?

Secretary RAIMONDO. It is such an excellent question, and as you think about AI, and the compute power that is going to be required for training these large models, it is much greater than any of us thought. One area of innovation in chips is making chips that consume less energy. And so the research and development money that we will spend, the NSTC, I suspect much of it will go to exactly this innovation, which is to say high-compute chips that are much more energy efficient because that—otherwise this won't be

sustainable. If you think what we need to do—match up what we need to do for sustainability with the amount of compute power, we need to have new innovations.

Senator MARKEY. And I wish my mother could hear a Rhodes Scholar tell me that I asked a good question. I wish you could hear that, Ma.

And just finally on the labor front, the good jobs that we are trying to create so that these families can thrive, have good wages, health care benefits, and the Commerce Department is going to be providing billions to these companies. And my feeling is they should be required to maintain strong labor standards for their workers, and non-union companies must provide workers a free and fair chance to join a union, and then bargain a good rate. Is that going to be the goal?

Secretary RAIMONDO. We agree.

The CHAIR. Senator Young.

Senator MARKEY. Thank you.

STATEMENT OF HON. TODD YOUNG,
U.S. SENATOR FROM INDIANA

Senator YOUNG. Thank you, Madam Chair. Madam Secretary, good to have you here. Dr. Panch, thank you. It is really important that my colleagues have an opportunity to ask these probing questions as it pertains to Implementation of CHIPS and Science to make sure it is implemented consistent with Congressional will and that we have effective administration. So thank you for being here.

In your testimony, Madam Secretary, you highlight the importance of being a good steward of taxpayer dollars. Can you tell the Committee, in summary fashion, how you have worked hard to be a good steward of taxpayer dollars as it pertains to implementation of CHIPS and Science? And then advise members who may be listening, because they ask me, how they can track, on an ongoing basis, implementation of CHIPS and Science dollars, in these investments?

Secretary RAIMONDO. OK. So as I said earlier, we have built a team of over 100 people to analyze each of these applications. Every company, in order to receive money, has to show us a financial plan, has to show us their books of their company, their research and development plan, their national security plan, their workforce plan. And as you said earlier, this has nothing to do with social policy.

This is ensuring that these companies can get the job done. You don't want—I don't want my taxpayer money given to a company that doesn't have a workforce plan and therefore can't get the job done, so all of those requirements are designed to do that. Furthermore, once we give the grant or structure the grant, there will be like an agreement, a contract, a compliance agreement. They are going to receive the money contingent upon them doing certain things, and we will tranche the money out on the basis of those milestones.

Senator YOUNG. Thank you. I have had some visibility into this process from the beginning, and worked with you and members of your team who are implementing, and I know that you have hired

on incredible talent, people with Wall Street experience, people who understand how much is needed for each of the stakeholders, and therefore much of your work is focused on making sure we don't overspend so that we have more resources to spend more effectively, and can advance national and economic security.

With respect to the Tech Hub Program, part of CHIPS and Science, the Regional Tech and Innovation Hub Program, you have spoken to this already, Madam Secretary. State of Indiana, we have submitted an application called Heartland BioWorks, and if designated, this would help cement Indiana's position as a very important locus of biotech, medtech, genomics, and synthetic biology innovation.

Secretary, Congress has only appropriated a portion of the Tech Hubs Program funding. What opportunities are we missing, especially in regards to leveraging private sector investment, by not prioritizing full funding of this program?

Secretary RAIMONDO. Yes. First, I want to thank you because you were a warrior to make sure this, the $500 million was in there. It is authorized at $10 billion, so we are missing massive opportunities. We have 400 applications from over 40 states, and we will only be able to make maybe five or six sizable grants. As I said earlier, we will designate say 20 tech hubs, plus or minus, and every one of them is probably worthy of maybe a $100 million. That right there is $2 billion.

So I think every bit of the $10 billion we could put to work to stimulate high-quality tech hubs. Your application is amazing, but then again, so are many of the others, and we will be really missing out.

Senator YOUNG. Sure. Dr. Panch, relatively, Senator Heinrich and I recently introduced the CREATE AI Act to establish the National Artificial Intelligence Research Resource to serve as a testbed for the development of artificial intelligence, and to help us harness the tech's amazing potential. Are you supportive of this CREATE AI Act; yes or no, sir?

Dr. PANCHANATHAN. Strongly supportive, yes, yes.

Senator YOUNG. Thank you. I have limited time, but if you could expand on the importance of federally funded research, including the National Science Foundation's National Artificial Intelligence Research Institutes, I would appreciate that. And then the importance of appropriating the CHIPS and Science Act's research authorization, I would note, at a time we are discussing artificial intelligence, and the critical importance of this to our national security, the National Security Commission on AI has recommended funding at $32 billion per year beginning in Fiscal Year 2026, artificial intelligence. So that lays a predicate for your response.

Dr. PANCHANATHAN. So as you know, AI of today has been made possible because of sustained investments, as I said earlier, through AI winters, even, over several decades. Here we are right now, and we have an adversarial competitor that is out-investing in some of these areas. This is not the time to hold back; this is not the time to discuss and debate; this is the time to actually invest, out-invest, out-compete in every aspect of what we need to do at AI.

And what we cannot have, and I just want to make this very clear, what we cannot have is a situation like what we have in semiconductors today, where we are trying to put the Band-Aids and trying to get it back into what it needs to work. We cannot lose that advantage in AI, or quantum, or advanced wireless, or biotechnology, you name it. And I am extremely concerned that we are not moving fast enough, because our competitors are outpacing us. And yes, we have a strategic advantage; we will not, and we should not, and must not lose it.

The CHAIR. Thank you.

Dr. PANCHANATHAN. So thank you for all your support.

The CHAIR. Senator Baldwin.

STATEMENT OF HON. TAMMY BALDWIN,
U.S. SENATOR FROM WISCONSIN

Senator BALDWIN. Thank you, Madam Chair. And welcome to both of our witnesses today. Secretary Raimondo, I want to thank you for your leadership in executing the Regional Technology and Innovation Hub Program. This committee worked very hard to craft that program, and the Appropriations Committee, on which I also sit, provided the initial funding to get this program up and running. And I have heard you loudly and clearly that we need to follow through with significant additional funding in the years to come.

As you know, Wisconsin worked hard to submit one sole application focused on bio-health and personalized medicine technology with a significant private-sector partnership and investment. As you also know, we have a rich history of innovation, world-class research institutions, and robust manufacturing, as well as a very strong workforce and work ethic. Wisconsin is poised to become a growth sector in this cutting-edge and valuable industry. I do not envy your team's task as you look through multiple applications, but I would have been remiss if I had not also highlighted our application, as many of my colleagues have today.

Now, shifting a bit, but not much, one of the fundamental issues that the CHIPS and Science Act aims to address is the too common occurrence of our American companies doing cutting-edge research and development in the United States and then manufacturing their product elsewhere. That is the story of the semiconductor in a nutshell, and part of why the CHIPS Act was necessary in the first place.

Now, current law requires inventions that stem from federally funded research to be manufactured in the United States, but that requirement is often waived and literally approved with just a rubber stamp. For example, a 2022 investigative report found that breakthrough battery technology, invented in a Federal lab and paid for with taxpayer dollars, was licensed by the Department of Energy to a Chinese company and manufactured in China.

Now, I know you are not here from the Department of Energy, but the Department of Commerce has an incredibly important role to play in the solution. Now, earlier this summer, President Biden signed the Invent It Here, Make It Here Executive Order. It bears a striking resemblance to legislation I introduced earlier this year

with Senator Vance, which we called the Invent Here, Make Here Act. Great minds think alike, that is what I will say.

Our legislation goes a little bit further than the executive order; it actually forbids licenses from being granted to countries of concern, as defined in CHIPS and Science, to include the PRC, among others. So given your role in carrying out the executive order and the duties Congress granted you in the CHIPS and Science Act over commercialization, I am interested to know your thoughts on the issue and the need for legislative action in this arena?

Secretary RAIMONDO. Thank you. So first of all, I fully agree with you that that is what happened with semiconductors, right. We used to make them in America, and in search of cheap labor, it all fled our shores, and look at where we are now. So I strongly support what you are trying to do. I also assure you there is no rubber stamping in these waivers.

We have to be practical; not everything is made in America; not everything can be made in America. However, we had a fantastic visit in Kenosha; that is a perfect example of because we, at the Commerce Department, have been holding their feet to the fire of those companies, we said we are not going to give you a waiver; we don't believe we need to, and they found a way to manufacture in your state.

Senator BALDWIN. And I just want to make the distinction between Buy America policies that say when we build out broadband, as you announced in Kenosha, Wisconsin, that we can't necessarily source, you know, from Nokia if they are not going to make it here. But you and, with the Buy America language, persuaded them to bring those jobs and that technology to the U.S. But here we are talking about new inventions funded by taxpayer dollars, and I feel we have a special obligation as stewards of our tax dollars to keep the manufacturing here.

Secretary RAIMONDO. Absolutely. No, no, I agree.

The CHAIR. Senator Capito.

STATEMENT OF HON. SHELLEY MOORE CAPITO, U.S. SENATOR FROM WEST VIRGINIA

Senator CAPITO. Thank you, Madam Chair. And thank you both for being here with us today, kind of a long afternoon. Secretary Raimondo and Dr. Panch, I guess I can call you that. I did vote for this bill because I think it is very critical. Secretary Raimondo, thank you for all of what you have done in broadband. We are looking forward to rolling this out. You and I have talked about this more than a few times, and you know how very important it is, not just to me, but to the rest of the country.

So I have been really interested to hear that your agency, the Department of Commerce, has run into an unexpected hurdle in implementing CHIPS, and that being the NEPA process. Well, I am on the EPW Committee; I am the Ranking Member, and this is an issue; it doesn't matter if it is chip manufacturing, broadband development, transmission, energy exploration, everything is being held up by the NEPA process, the permitting process, and often the ensuing litigation delays that come forward.

So then I heard that there is an—I mean, Senator Cruz has an amendment with Senator Kelly to exempt the NEPA process for

the fabs for this particular bill, that would exempt the NEPA process; is that correct? And you spoke in favor of that?

Secretary RAIMONDO. Yes.

Senator CAPITO. How does this administration, with you as their representative, actually square exempting one industry over another when it is holding up progress in all of National Security, energy security, communication, everything? Why would that be a good idea, and how can this Administration think that is a good idea?

Secretary RAIMONDO. I can only speak to chips, and what I said earlier was sometimes these processes could take 10 years or 8 years.

Senator CAPITO. Right. Right.

Secretary RAIMONDO. And each of these would be for chips, it is a national security imperative. So what we are doing—but of course, I want to be crystal clear, we have to maintain basic environmental protections, and we will as we build out these manufacturing facilities. We are not looking to get rid of environmental protections; we are just looking to have a more streamlined process so we can——

Senator CAPITO. OK. We agree on that. I am not getting—I am not into eliminating environmental protections, but the length of all these projects, I would say to you, energy security is just as important as chip security. I would say transmission in this country is just as important as something that does with manufacturing chips. And then if you are going to manufacture the chips, you have got to mine them, and recover them. And that means you have to permit the mine.

If you look at arsenic, which is used in chips, 97 percent of that is from China. If you look at cobalt 70 percent of that is from China, rare earth elements, 60 percent of that is from China, 10 percent from the United States, titanium, 86 percent from Japan, noble gases are from Russia and Ukraine, but we have these resources in this country, but we can't get these mines to permit.

So how are you going to go from permitting the fab when you can't get the material materials permitted? There is a disconnect here. And you know I would be fine to try to work this disconnect out because, as I said in the beginning, I think this is exceedingly important for our future.

Secretary RAIMONDO. Yes, as you say, this is complicated, and there is a balance. I know that the Chair, in a bipartisan way, has worked on an amendment in the NDAA as it relates to chips. I am no way saying that these other issues aren't also so important and they, you know, merit further discussion.

Senator CAPITO. Well, I mean, I just think it is rather ironic the administration would actually make an exception for something they consider a marquee plan for them, albeit, in the best interest of the country when there is these other things that I think, politically, are more difficult to touch that they wouldn't look for the streamlining of permitting, which should be fair and even across the board without giving up any environmental controls. I sit on the Committee that does this. I have been very strong on air and water all the way through, but there is a better way to do it.

Let me just ask you one quick question, and then you can respond. I think you have been asked this before, but I do obviously have my West Virginia Tech Hub application in, and we are all putting our foot on the scale for our own projects. I understand the program requires one-third of Tech Hub Grants and designations must significantly benefit a small and rural community, so that means one out of the three hub designations under phase two would be awarded to rural communities; is that a safe statement?

Secretary RAIMONDO. One—yes.

Senator CAPITO. OK, yes, one-third?

Secretary RAIMONDO. Rural, right, one third—the statutory requirement is one-third in rural or small communities, yes.

Senator CAPITO. OK. So that is still the plan?

Secretary RAIMONDO. Yes. Yes.

Senator CAPITO. OK. Thank you.

The CHAIR. Thank you. Senator Sinema.

Senator CAPITO. All right. Sorry.

STATEMENT OF HON. KYRSTEN SINEMA,
U.S. SENATOR FROM ARIZONA

Senator SINEMA. Thank you, Chair Cantwell.

The CHAIR. Two people left, just hurry, if we can. Thank you so much.

Senator SINEMA. Well, thank you for our witnesses joining us today, and I am proud to play the central role, in ensuring that the historic CHIPS and Science Act was signed into law. A year later, the positive impact on our economy and national security is clear, and nowhere is this more evident than in my state, Arizona. You know, we have led on CHIPS since the 1940s, and we will continue to lead with the help of the CHIPS and Science Act.

I was delighted to see the Department of Defense select Arizona State University's Southwest Advanced Prototyping Hub as the first and largest allocation from the law to continue its great work accelerating micro-electronic research and development. In fact, since 2020, Arizona has led the Nation in semiconductor investment. This includes major projects from Intel and TSMC.

These investments are essential, but Arizona's leading semiconductor manufacturing ecosystem is built on the hundreds of chip-related companies working at all phases of the manufacturing lifecycle, as well as the academic institutions, workforce training programs, and small businesses that make it possible.

And that is why it was so important to address semiconductor manufacturing holistically. You know, there was a time when it looked like the scientific development portions of the law would fall victim to partisan fighting, and thankfully, Senator Young, myself, and other members worked across the aisle to make sure that didn't happen.

So turning to our witnesses, I want to first start by welcoming and recognizing my friend and fellow Arizonan, Panch, and the amazing work that you are doing at NSF.

Dr. PANCHANATHAN. Thank you.

Senator SINEMA. You know, I got to see your work advancing education, science, and innovation firsthand at ASU, and in the senior advisory roles you played in our state government, and now

I see that same dedicated insight implementing this legislation at the Federal level. So thank you, Panch.

Dr. PANCHANATHAN. Thank you.

Senator SINEMA. My first question for you is that the workforce provisions of the law, including the CHIPS for America Workforce Education Fund, are essential to building a healthy economy and fueling rewarding careers. Can you just briefly comment on how the NSF funding, along with public-private partnerships have helped to get resources where they are needed, specifically in Arizona?

Dr. PANCHANATHAN. Thank you very much, Senator Sinema. It is truly a pleasure to hear from you, and you are just taking me back to the years in Arizona by what you said. So it is always a pleasure. The workforce investments that we are making through the CHIPS and Science Act, is a total of $200 million over 5 years, this year it is $25 million, we are focusing on ensuring that pairing up with the investments by Intel and Micron as our partners who are co-investing with us, are being deployed in ensuring that we are training the workforce.

Not only in terms of what we do with community colleges and universities, but also training the trainers, namely the teachers in K–12 institutions, so that we have this pipeline of talent ensured for times to come. So we are working on all of those component parts as we are thinking about deploying these resources. We are also working on some projects which are focused on internships with industry, as well as making sure that upskilling, reskilling efforts are also invested in. So it is a comprehensive investment of what we are doing with CHIPS and Science, as well as the main investments of NSF, which has always prioritized key technologies like semiconductor technologies.

So we are very happy, and we are looking forward to the outcomes, which is very important at this time when there is so much of a need for a trained, skilled technical workforce in semiconductors, as was pointed out by many of the senators today. So thank you so much for your support and championship of this CHIPS and Science Act.

Senator SINEMA. Well, thanks so much, Panch.

Secretary Raimondo, I appreciate the vision you outlined today for the Department's economic and national security priorities, at the heart of the CHIPS and Science Act. To keep pace with these goals, like establishing large-scale clusters of leading-edge logic fabs, while ensuring supply chain resilience and a robust American workforce, the chip projects must actually be funded to be workable.

Unfortunately, the NEPA reviews currently required for CHIPS grants could slow down the fund dispersal to grantees and prevent actual construction by 2 years or more from the date the Department decides to start an environmental impact. This is a huge barrier to bringing new capacity online with the urgency required. Thankfully, I worked this summer to include our bipartisan provisions in the NDAA that would streamline Federal reviews while keeping environmental protections in place.

You testified previously before the House Science Committee that you support this language, and I just want to check with you: Do you still support it?

Secretary RAIMONDO. Yes.

Senator SINEMA. Great. Madam Chair, I have follow up questions that I will send over to the Secretary and to Panch. But in the interest of time, I will yield back for another member.

The CHAIR. Thank you so much. Senator Budd.

STATEMENT OF HON. TED BUDD,
U.S. SENATOR FROM NORTH CAROLINA

Senator BUDD. Thank you, Madam Chair. Secretary Raimondo, thank you for being here. Thank you both for being here.

The Commerce Department has a lot of important rollout responsibilities with the CHIPS and Science Act and the Broadband, Equity, Access and Deployment, or the BEAD Program, we have talked a lot about that here today. So I hope that you would agree that your Department needs to carefully adhere to Congress' intent in both of those laws.

Unfortunately, serious concerns are coming to light about this administration's handling of $65 billion going to broadband. Over the summer, the Commerce Department's Inspector General issued an alert stating that Commerce is failing to do basic checks, resulting in potential unlawful duplication. Recently, *The Wall Street Journal* reported that Commerce-funded broadband will cost more to bring broadband to a home than the assessed value of that home. That is *The Wall Street Journal.*

And 2 weeks ago, after months of letters from my colleagues and I, with concerns that have been ignored, we released a report that found this administration is unlikely to reach all connected Americans with broadband. Now, this is due in large part to this administration's extreme bias against non-fiber technologies, technologies like fixed wireless, and satellite broadband, and then also its allocation of funding to parts of the country that already have high-speed broadband, like right here in Washington, D.C., unfortunately.

And as the report went on to uncover, the Department of Commerce allocated Washington, D.C. more than $547,000 per unserved location. 33 percent of those locations are at the national zoo. This is a waste of taxpayer money. I think that most taxpayers would be horrified by the prospect of spending upwards of $100,000 or $200,000 to connect a single location, especially when many of these homes could be connected by alternative or innovative technologies at an exponentially lower cost to taxpayers.

So the question: Would it be better for taxpayers to spend $200,000 on a fiber connection to a single home that is worth $50,000? That is $200,000 to connect it; that is a connection fee and cost to a home worth $50,000? Or would it be better to spend $500 connecting that house to high-speed satellite?

Secretary RAIMONDO. Thank you, Senator, for your question. First, I want to say the statute provides for 100——

Senator BUDD. Yes. Let us just go back. Thank you. Thank you for the elaboration. I know it is into the day, but if you could just

answer: Is it better to spend $200,000 on a $50,000 house, or is it better to spend $500 connecting it to satellite?

Secretary RAIMONDO. It depends on the quality. The five-year——

Senator BUDD. So you are saying it might be worth spending $200,000 of everyone's taxpayer money to connect to a $50,000 house when you could do it for $500. Did I hear that correctly, madam?

Secretary RAIMONDO. First of all, this isn't my decision. Your Governor in your state will provide a plan. Our job is to make sure that at the end of that plan, every single North Carolinian, regardless of where they live, has high-quality, affordable internet.

Senator BUDD. Look, I appreciate that, but I don't need to be spending $200,000——

Secretary RAIMONDO. Low-quality satellite doesn't help anyone.

Senator BUDD. Here is what is happening. Let me get to the point. Thank you, madam. Would it be worthwhile, because here is what is actually happening: Would it be worthwhile for taxpayers to spend $200,000 on a fiber connection to a mansion that is worth $5 million?

Secretary RAIMONDO. Nobody says fiber has to be used, and I doubt the mansion is unconnected.

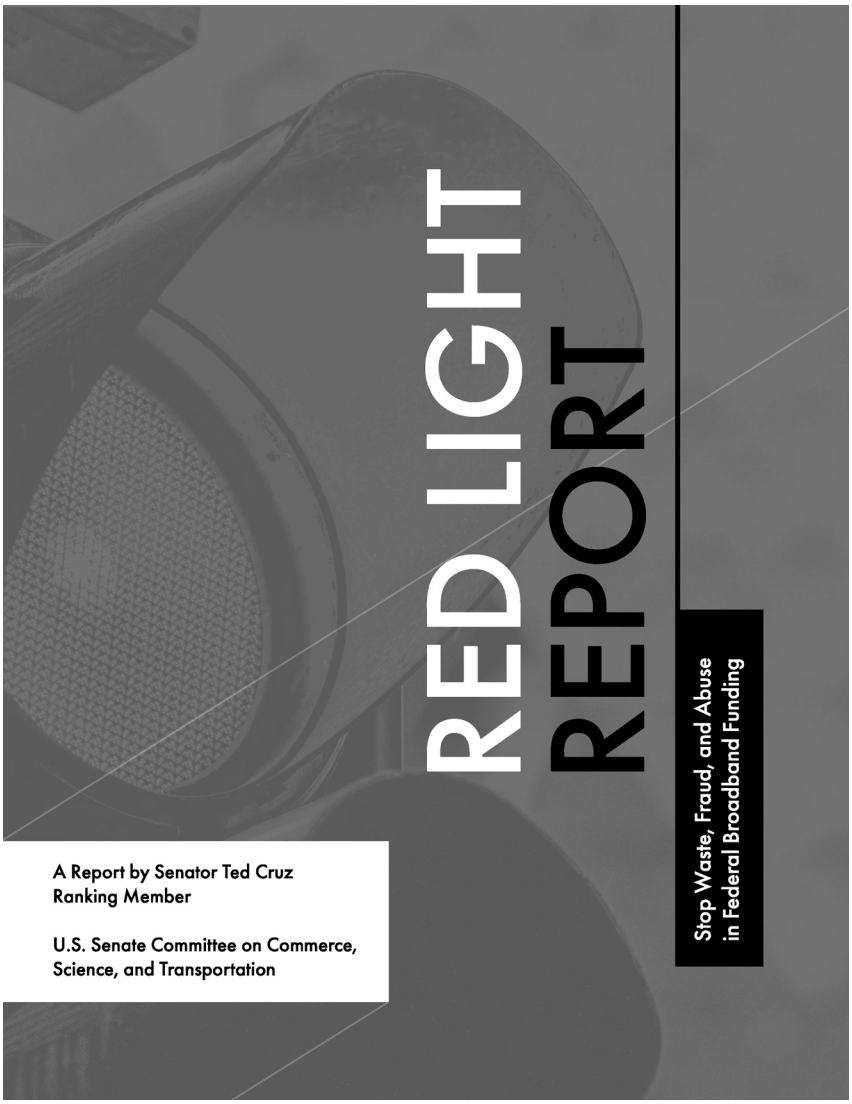
Senator BUDD. Well, there seems to be a bias toward fiber. That is what is happening. It is happening right now because the Biden Administration, it has shunned wireless and satellite alternatives. Further, Biden's BEAD rules allow taxpayers' subsidies to go toward building fiber to mansions and vacation homes. These rules prohibit states from funding nonfiber projects, except in extreme situations.

Now, these are extreme situations, which you may have begun to elaborate on, but unless they get a waiver, a waiver from the Federal Government to do the alternative. So I urge you to eliminate tech bias from your rules, and put in sensible limits that would stop subsidizing millionaires.

And in my remaining time, Madam Chair, I would like to mention this report put out by the Ranking Member, the Red Light Report, which is to stop waste, fraud, and abuse in Federal broadband funding. And I would like to submit it for the record.

The CHAIR. Without objection.

[The information referred to follows:]


RED LIGHT REPORT
Stop Waste, Fraud, and Abuse in Federal Broadband Funding
A Report by Senator Ted Cruz
Ranking Member
U.S. Senate Committee on Commerce, Science, and Transportation

EXECUTIVE SUMMARY

A recurring theme in our political system is the government's habit of throwing taxpayer dollars at problems without ever solving them. One costly example is access to high-speed Internet. As the Internet has become a part of daily life, there have been bipartisan calls for the government to ensure that no one is left unconnected. Yet even after billions in spending by numerous federal agencies over two decades, many Americans still lack access to high-speed broadband.

In June, the Biden administration allocated $42.45 billion in Broadband Equity, Access, and Deployment (BEAD) funding among states—the largest single pot of federal broadband spending in our country's history. Biden officials at the National Telecommunications and Information Administration (NTIA) made these allocations despite repeated requests from lawmakers and communities across the country to first improve the data underlying NTIA's funding decisions.[1] I also joined colleagues in asking officials to eliminate the social agenda that was attached to this infrastructure program—extralegal provisions not found in any statute that raise the cost of projects and reduce the number of Americans who will benefit.[2]

Biden officials largely dismissed these concerns, claiming that BEAD allocations would "make sure everyone in America has access to high-speed Internet and our digital society."[3] Now that NTIA has made BEAD allocations, however, it appears that the program will waste billions of dollars in duplicative subsidies and divert funds away from truly unserved rural areas. This report analyzes the current state of BEAD funding, on a per-beneficiary basis and in the context of three other recent federal programs that already doled out $17 billion for broadband deployment. It offers three key findings:

1. The Biden administration's BEAD allocations provide ten states and territories more than $10,000 per unserved location—including a galling $547,254 per unserved location in Washington, D.C.

2. Because the BEAD program did not consider whether a location would be served in the near future through funding from a previous federal program, it allocated funding to over five million locations that are already being funded by other federal programs. If funding from other programs had been considered, seven states would have had zero unserved locations. As a result, the billions in taxpayer dollars sent to these states will be diverted to purposes other than connecting unserved Americans.

3. The Biden administration's technology bias against non-fiber broadband will drive up costs by billions of dollars and likely deprive some communities of any broadband access at all. Further, some of the "unserved" locations that will receive taxpayer-subsidized fiber-to-the-home service include mansions, beachfront resort communities, and mountain vacation homes.

Forty-two billion dollars is more than enough money to deliver broadband to every American. Will it succeed in doing so? In light of these findings, count me skeptical. This report should serve as a call to action for the Biden administration and the states to ensure BEAD dollars are not funneled to duplicative and wasteful purposes, and instead are used to solve the nation's connectivity challenges once and for all.

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[1] *See, e.g.*, Letter from Ted Cruz and John Thune, U.S. Senators, to Alan Davidson, Asst. Sec. Nat'l Telecomm. & Info. Admin. and Jessica Rosenworcel, Chairwoman, Fed. Commc'n. Comm'n. (Feb. 3, 2023); Press Release State of Texas, Texas Comptroller Glenn Hegar Petitions Federal Government on Timing of its Broadband Map Development, Release of Federal Broadband Funding (Dec. 13, 2022), https://comptroller.texas.gov/about/media-center/news/20221213-texas-comptroller-glenn-hegar-petitions-federal-government-on-timing-of-its-broadband-map-development-release-of-federal-broadband-funding-1670529272704; Press Release State of Vermont, VCBB and Vermont's Congressional Delegation Ask the FCC for More Time to Challenge Its Maps, (Dec. 21, 2022), https://publicservice.vermont.gov/announcements/vcbb-and-vermonts-congressional-delegation-ask-fcc-more-time-challenge-its-maps.

[2] Letter from Sen. Ted Cruz, Ranking Member, S. Comm. on Commerce, Science, and Transportation, U.S. Senators, *et al.*, to Alan Davidson, Assistant Sec'y, Nat'l Telecomm. & Info. Admin. (Apr. 20, 2023).

[3] Letter from Paul Desai, Dir. of Cong. Affairs, Nat'l Telecomm. & Info. Admin. to Sen. Ted Cruz, Ranking Member, S. Comm. on Commerce, Science, and Transportation (Mar. 10, 2023).

OVER $125 BILLION IN FEDERAL BROADBAND SPENDING

Over the past four years, the federal government has dedicated over $125 billion in funding for broadband connectivity. Most of this funding was allocated to build broadband connectivity to homes and businesses. Major broadband funding of at least $1 billion has been divided among four federal agencies: the National Telecommunications and Information Administration (NTIA) within the U.S. Department of Commerce; the U.S. Department of Agriculture (USDA); the U.S. Department of Treasury (Treasury); and the Federal Communications Commission (FCC).

Table 1: Federal Programs with at least $1 billion in Funding for Broadband

TOTAL FUNDING SINCE 2019	AGENCY	PROGRAM NAME	STATUS
			BROADBAND FUNDING FOR DEPLOYMENT: $82.2 BILLION
$42.45 BILLION	NTIA	Broadband Equity, Access, and Deployment (BEAD)	NTIA announced funding allocations for each state, but funds have not yet been made available for projects. NTIA reserved $849 million to administer the program—about 7 times more than the NTIA total staff budget request for Fiscal Year 2024—that is effectively a block grant program administered by state offices.
$21.6 BILLION	FCC	High Cost Program	Total amount disbursed to companies from 2019-present to subsidize broadband networks, including build out, in high cost rural areas. This funding includes Rural Digital Opportunity Fund, Connect America Fund Phase II, A-CAM, legacy rate-of-return, and other programs.
$10 BILLION	Treasury	Capital Projects Fund[a]	Treasury has approved funding applications for most states with five states and territories remaining to be approved.
$5.15 BILLION	RUS	ReConnect	Funding has been awarded to broadband connectivity projects that are in phases of planning, construction, and completion.
$3 BILLION	NTIA	Tribal Broadband Connectivity Fund	$1.8 billion has been awarded from the first funding round and another application period has been opened.
			BROADBAND FUNDING FOR OTHER USES: $47.1 BILLION
$14.2 BILLION	FCC	Affordable Connectivity Program (ACP)	Provides $30/month broadband subsidy (or $75/month for Tribal households) to more than 19 million enrolled households, in addition to one-time discount of $100 to purchase a laptop, desktop computer, or tablet.
$7.1 BILLION	FCC	Emergency Connectivity Fund	$6.95 billion in funding awarded to schools and libraries for devices and broadband connections for remote learning during the COVID-19 pandemic.
$7 BILLION	Treasury	State and Localities Fiscal Recovery Funding	Total funding for this program is $350 billion; states and localities have thus far reported using $7 billion towards broadband-related projects.
$11.9 BILLION	FCC	E-Rate	Funding committed to schools and libraries for discounts ranging from 20 percent to 90 percent of the costs of eligible services including telecommunications services and Internet access.
$3.2 BILLION	FCC	Emergency Broadband Benefit	COVID-era broadband subsidy program that was replaced with ACP.
$2.7 BILLION	NTIA	Digital Equity and Inclusion	$600,000 in planning grants awarded; up to $60 million will be awarded in planning grants before remaining funding is made available.
$1 BILLION	NTIA	Middle Mile Infrastructure	$930 million in funding has been awarded.

Sources: Reporting from agency websites.
Table Note: [a] This program is aimed toward broadband but funding may be used for other investments that meet Treasury criteria.

This is a huge amount of taxpayer investment spread throughout various programs at these agencies. And yet, this is not the federal government's first attempt to address broadband connectivity. The 2009 American Recovery and Reinvestment Act provided over $7 billion in broadband funding to NTIA and USDA, and quantifiable benefits were hard to come by.[4] Previous failures have been attributed to both poor data—the funding did not go to the right places; and a lack of funds—there supposedly was not enough money to achieve universal connectivity. The Biden administration suggests it will succeed where past attempts have failed, due to improved FCC data depicting where broadband gaps exist, and the unprecedented amount of funds currently dedicated to broadband.[5]

This report offers a deep dive into the single largest pot of money ($42.45 billion) through the NTIA's Broadband Equity, Access, and Deployment (BEAD) program, and highlights potential pitfalls that could result in some areas remaining unserved despite this mammoth investment.

> "JUST LIKE FRANKLIN DELANO ROOSEVELT'S RURAL ELECTRIFICATION ACT BROUGHT ELECTRICITY TO NEARLY EVERY HOME AND FARM IN AMERICA, **PRESIDENT BIDEN AND VICE PRESIDENT HARRIS ARE DELIVERING ON THEIR HISTORIC COMMITMENT TO CONNECT EVERYONE IN AMERICA TO RELIABLE, AFFORDABLE HIGH-SPEED INTERNET BY THE END OF THE DECADE."**[6]
>
> – The White House

[4] *See, e.g.*, U.S. Gov't Accountability Office, GAO-12-937, Broadband Programs Are Ongoing, and Agencies' Efforts Would Benefit from Improved Data Quality (Sept. 2012) (describing the failed $4 billion Broadband Technology Opportunities Program created by the American Recovery and Reinvestment Act of 2009), https://www.gao.gov/assets/gao-12-937.pdf.

[5] Press Release, Nat'l Telecomm. & Info. Admin., Biden-Harries Administration Launches $45 Billion "Internet for All" Initiative to Bring Affordable, Reliable High-Speed Internet to Everyone in America (May 13, 2022), https://broadbandusa.ntia.doc.gov/news/latest-news/biden-harris-administration-launches-45-billion-internet-all-initiative-bring.

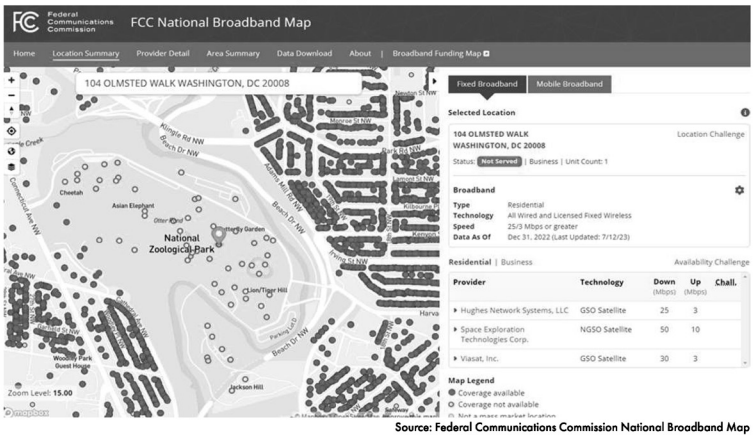
[6] Press Release, The White House, Fact Sheet: Biden-Harris Administration Announces Over $40 Billion to Connect Everyone in America to Affordable, Reliable, High-Speed Internet, (June 26, 2023), https://www.whitehouse.gov/briefing-room/statements-releases/2023/06/26/fact-sheet-biden-harrisadministration-announces-over-40-billion-to-connect-everyone-in-america-to-affordable-reliable-high-speed-internet/.

BEAD ALLOCATIONS DIVERT FUNDING FROM TRULY UNSERVED AREAS

On June 26, 2023, the Biden administration announced BEAD allocations, dividing up $42.45 billion in funding for U.S. states and territories (herein collectively referred to as states). The Biden administration allocated BEAD funding to states based on each state's proportionate number of unserved locations, as reflected in the FCC's National Broadband Map.[7] States and territories also received a minimum amount of funding—each state, Washington, D.C., and Puerto Rico, were respectively allocated a baseline amount of $100 million, and the remaining territories were allocated a minimum of $25 million each. The resulting allocations disproportionately benefited states with few unserved locations (see Appendix I table one for full breakdown of funding per unserved location). For example, Washington, D.C., and Delaware—both of which are geographically small with dense populations—were respectively allocated more than $547,000 and $52,000 per unserved location—significantly more than the nationwide median allocation of $5,600 per unserved location.

According to the FCC's National Broadband Map, which was used by NTIA to allocate BEAD funding based on each state's share of unserved locations, 58 of the 184 unserved locations in D.C. are at the Smithsonian National Zoo, including the Butterfly Garden, Lion-Tiger Hill, and the Otter Pond. Red circles in the map below indicate each such location.

FCC National Broadband Map shows 33% of Unserved Locations in Washington D.C. are at the National Zoo



Source: Federal Communications Commission National Broadband Map

[7] Fed. Commc'n. Comm'n., National Broadband Map, https://broadbandmap.fcc.gov/home (accessed Aug. 2, 2023).

Providing Washington, D.C., which appears to have almost no unserved locations, with such a disproportionately large amount of funding diverts BEAD funds from truly unserved areas of the country. Although states are required to prioritize BEAD projects that will connect unserved locations, they may use their funding for other purposes if they certify to NTIA that all unserved locations in the state will be served.[8] As a result, it is likely that in states with few unserved locations, BEAD funding will be diverted to purposes other than bringing broadband access to those without service.[9]

New Biden BEAD funding to Close Digital Divide at the National Zoo

Source: Created by Commerce Committee Staff with artificial intelligence application.

[8] *See, e.g.*, Infrastructure Investment and Jobs Act, Pub. L. No. 117-58, §§ 60102(f), (h)(1) (2021).
[9] Biden administration guidance states that "Eligible Entities that demonstrate they will be able to ensure service to all unserved and underserved location will be free to propose plans that use remaining funds in a wide variety of ways… [such as] access-, adoption-, and equity-related uses…". Nat'l Telecomm. & Info. Admin., NTIA-BEAD-2022, Notice of Funding Opportunity: Broadband Equity, Access, and Deployment Program (May 13, 2022), https://broadbandusa.ntia.doc.gov/sites/default/files/2022-05/BEAD%20NOFO.pdf.

BEAD ALLOCATIONS FAIL TO CONSIDER BILLIONS IN BROADBAND SPENDING FROM OTHER PROGRAMS

In addition to over-allocating BEAD dollars among states with few, if any, broadband availability gaps, the Biden administration's BEAD allocations also failed to account for other recent federal broadband spending. That failure, too, will likely lead to waste. BEAD is only one of many recent broadband funding programs, as outlined in table 1 above. For example, three other federal programs have collectively recently allocated almost $17 billion in taxpayer money:

1) **FCC's Rural Digital Opportunity Fund (RDOF);**
2) **Treasury's Capital Projects Fund (CPF); and**
3) **USDA's ReConnect program.**

As discussed, the Biden administration allocated BEAD funding to states based on each state's proportionate number of unserved locations, as reflected in the FCC's National Broadband Map. According to the FCC's map, there are approximately 8.3 million unserved locations in the U.S. That number, however, is an overestimate since the FCC's map only depicts current broadband availability and does not account for areas where broadband funding has already been allocated, but networks have not yet been completed.

Combined, RDOF, CPF and ReConnect have reported that they will serve over five million locations in the next several years. These three programs alone are thus projected to reduce the number of unserved locations by more than half, leaving the BEAD program with just over three million unserved locations to address. If these locations had been considered served, seven states and territories would have been left with zero locations remaining to be served by BEAD. (See table 2 in the Appendix for full list of number of locations to be served by state.) **Because of the failure to count these locations as served, there are over 85,000 locations in seven states and territories that are effectively being double-counted, or twice-served.**

Table 2: Other Federal Broadband Deployment Programs with Estimated Locations to Be Served

AGENCY	PROGRAM	CURRENT ALLOCATION	NUMBER OF LOCATIONS TO BE SERVED
FCC	Rural Digital Opportunity Fund	$6 billion	2.8 million
TREASURY	Capital Projects Fund	$7 billion	1.9 million
USDA	ReConnect	$3.9 billion	.4 million
TOTAL		$16.9 billion	5.1 million

Sources: Reporting on agency websites.

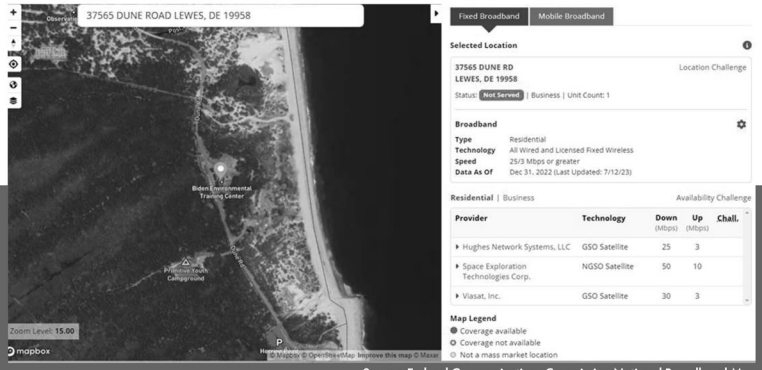
It is important to note that these estimated numbers of locations served by other federal broadband programs are conservative and do not account for all recent federal broadband funding. For example, Treasury reporting shows that at least $7 billion of Coronavirus State and Local Fiscal Recovery Funds (SLFRF), provided for in the American Rescue Plan Act of 2021, has been used to fund broadband-related projects.[10] Treasury, however, does not report the number of estimated locations to be served by this funding. Therefore, SLFRF funding is not included in this analysis.

[10] *See, e.g.*, American Rescue Plan Act of 2021, Pub. L. No. 117-2 (2021); Recipient Compliance and Reporting Responsibilities: Public Reporting, U.S. Dep't of Treasury, https://home.treasury.gov/policy-issues/coronavirus/assistance-for-state-local-and-tribal-governments/state-and-local-fiscal-recovery-funds/recipient-compliance-and-reporting-responsibilities (last visited July 13, 2023).

CASE STUDY: DELAWARE

A closer look at unserved locations in Delaware provides an illustration of the inefficiencies described above. In June, the Biden administration allocated Delaware almost $108 million BEAD funding to serve the state's 2,166 unserved locations. One of these locations is the Biden Environmental Training Center (pictured below), a state-run conference, training, and retreat center situated just eleven miles north of Rehoboth Beach.

"Unserved" Biden Environmental Training



Source: Federal Communications Commission National Broadband Map

Taking into account other federal broadband monies Delaware already received, the state should already have more than enough funding to build broadband to all 2,166 currently unserved locations—including the Biden Environmental Training Center—without BEAD dollars. In November 2020, more than $13 million was awarded to cover 7,749 unserved locations in the state under the FCC's RDOF program, over an eight-year buildout timeline. None of these connections have thus far been built, according to the FCC's map.

Further, Delaware, in 2022, awarded an additional $33 million in CARES Act and American Rescue Plan Act funds to build broadband to over 6,500 homes and businesses. Much of this funding is likely going toward duplicative buildout: in total, recent federally funded projects in Delaware are slated to serve over 14,000 locations—seven times more than the approximately 2,000 unserved locations in the state according to FCC's map. Delaware is about to receive $108 million more through the BEAD program, the risk of duplicative spending is obvious and palpable.

[11] *See, e.g.*, Broadband Strategy for Delaware, Broadband Strategy Dashboard, Delaware Broadband Office. https://experience.arcgis.com/experience/c8637db6327646f9bf33432da9b82f85/?data_id=widget_17_ouput%3A0 (accessed Aug. 28, 2023).

THE BIDEN ADMINISTRATION'S EXTREME TECHNOLOGY BIAS:
A FURTHER RECIPE FOR WASTE

In drafting the BEAD provisions of the IIJA, Congress pursued a policy of tech neutrality, allowing any provider to participate if it could meet the statute's performance requirements.[12] Congress pursued this policy for good reason: technology neutrality has been a guiding principle for broadband innovation over the last two decades. Consumers benefit the most when the market—not the government—picks winning and losing technologies. In contrast, tilting rules to favor specific types of providers harms innovation and drives up costs for taxpayers.

Despite the statute's technology-neutral stance, NTIA's implementing regulations take a different approach and generally prohibit non-fiber projects from participating in the BEAD program. In NTIA's notice of funding opportunity (NOFO), the agency instructed states to award BEAD funding to "priority projects," which it defined as projects that will provide service "via end-to-end fiber-optic facilities to each end-user premises" unless the cost per location exceeds the "Extremely High Cost Per Location Threshold" or for "other valid reasons" subject to NTIA approval.[13] NTIA further instructed states to "set the Extremely High Cost Per Location Threshold **as high as possible** to help ensure that end-to-end fiber projects are deployed wherever feasible (emphasis added)."[14] In other words, NTIA's rules effectively block states from funding non-fiber projects without permission from the agency despite what the law says.

This bias will drive up costs and waste taxpayer dollars, especially if the Biden administration's implementation of other programs serves as precedent. The Biden administration spent over $200,000 per location for one award in USDA's ReConnect broadband grant program, and on average spent $22,000 per location across all ReConnect awards for 2023.[15] The top two most expensive cost-per-location awards—$236,000 and $191,000—went to companies in New Mexico that will provide fiber broadband service to 135 households for a combined $26 million. By contrast, the Technology Director for the Cuba Independent School District in New Mexico recently testified before Congress that his school district purchased satellite-based (non-fiber) broadband for unconnected households, **with a reported cost per location of $500, or two percent of the cost of the two recent New Mexico ReConnect projects.**[16] Further, the project reached speeds in excess of BEAD requirements and, according to the Technology Director's testimony, satellite connections were installed quickly and avoided permitting obstacles common with fiber builds.[17] The Biden administration's extreme fiber bias will thus invariably lead to overspending and diminished competition at the expense of unserved communities.

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[12] Specifically, the statute states that the internet service provider "shall provide broadband service at a speed of not less than 100 megabits per second for downloads and 20 megabits per second for uploads; with a latency that is sufficiently low to allow reasonably foreseeable, real-time, interactive applications; and with network outages that do not exceed on average 48 hours over any 365-day period." *See* Infrastructure Investment and Jobs Act, Pub. L. No. 117-58 (2021).

[13] Nat'l Telecomm. Info. & Admin., *supra* note 9.

[14] *Id.*

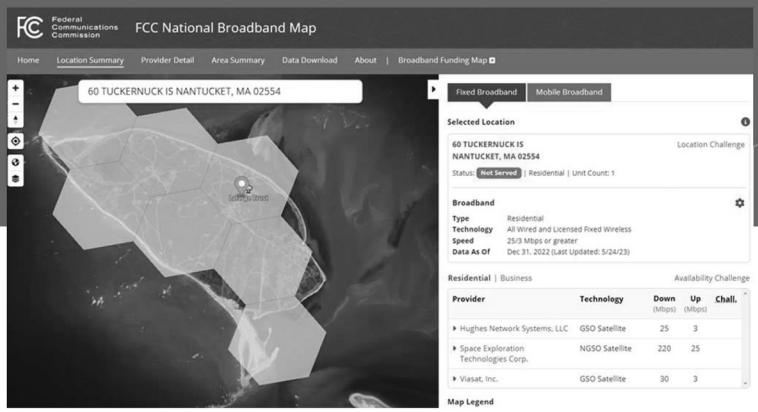
[15] Calculations by Commerce Minority staff based on information as reported by United States Department of Agriculture on ReConnect Program FY 2023 Awardees, https://www.usda.gov/reconnect/round-four-awardees (accessed July 13, 2023).

[16] Cedar Attanasio, *Rural New Mexico school buys Starlink internet for students,* Associated Press (Dec. 29 2021), https://apnews.com/article/technology-cuba-new-mexico-education-36333e9a8820378463cba60b03f1b745.

[17] *The State of Universal Service: Hearing Before the Sub. Comm. on Communications, Media, and Broadband of the S. Comm. on Commerce, Science, and Transportation,* 118th. Cong. (May 11, 2023) (testimony of Timothy Chavez, Dir. of Technology, Cuba Independent School District, New Mexico).

Moreover, NTIA ignores the reality that alternative technologies like fixed wireless and satellite may be better suited to different consumers and geographies. Take, for example, Tuckernuck Island, a small private island off the coast of Massachusetts where property values are listed as over $1 million. The island has no wired service, but it does have access to satellite service with speeds that exceed the thresholds set by Congress for BEAD, according to the FCC's map. However, because the Biden administration's BEAD rules summarily exclude certain technologies—namely unlicensed fixed wireless and satellite—from being considered "reliable broadband service," the entire island is considered unserved for the purposes of BEAD and eligible to be overbuilt. This summary exclusion is not only at odds with the IIJA but real-world cases where non-fiber technologies have served as reliable and innovative alternatives.[18]

Unserved Private Island Off The Coast of Massachusetts



Source: Federal Communications Commission National Broadband Map

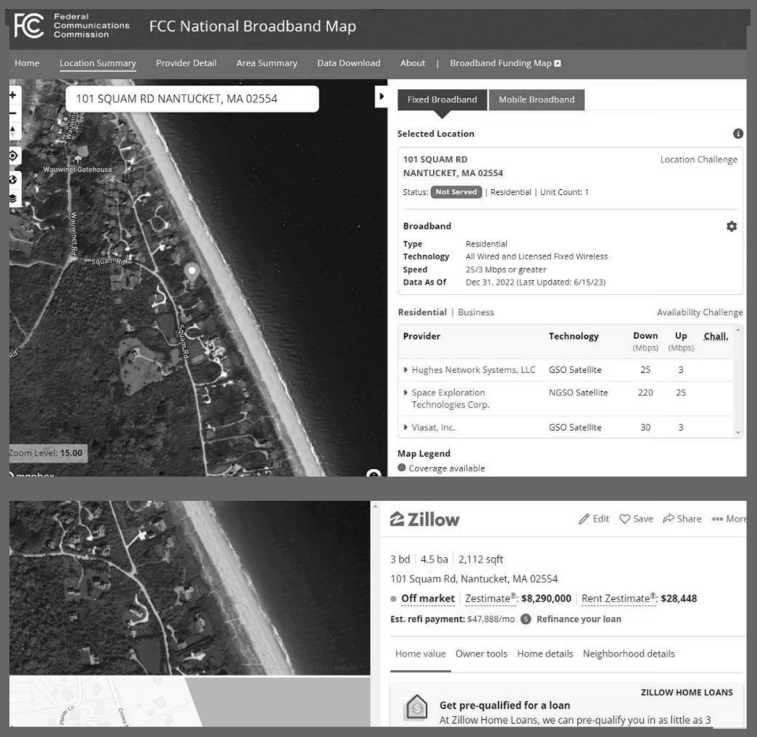
Beyond the fact that running fiber to this remote island would likely come at an exorbitant cost, it is not even clear that residents would want it. According to one local real estate website, this area is collectively owned, fully off the electrical grid, and has no grocery stores or restaurants in order to embody a "simpler way of life."[19] BEAD's lack of consideration as to whether an unserved location truly needs taxpayer subsidies means that locations like Tuckernuck, will be prioritized to receive expensive fiber service. Below are further examples of "unserved" locations in the queue for BEAD-funded fiber broadband: beachfront communities, mountain wedding venues, and mansions.

[18] *See, e.g.*, Michael O'Rielly, *Responding to Biden Administration's Tech Neutrality Rejection*, Blog post, TMT AND ME (Sep. 7, 2022) https://mporinc.blogspot.com/2022/09/; Dr. William Lehr, *Getting to the Broadband Future Efficiently with BEAD Funding*, WISPA (Jan. 2023), https://www.wispa.org/docs/Lehr_White_Paper_Final.pdf.

[19] Fisher Real Estate, Stories: Tuckernuck Island, Nantucket (Oct. 10, 2020), https://fishernantucket.com/tuckernuck/#:~:text=Tuckernuck%2C%20just%20west%20of%20Madaket,to%20keep%20it%20that%20way.

EXAMPLE 1:

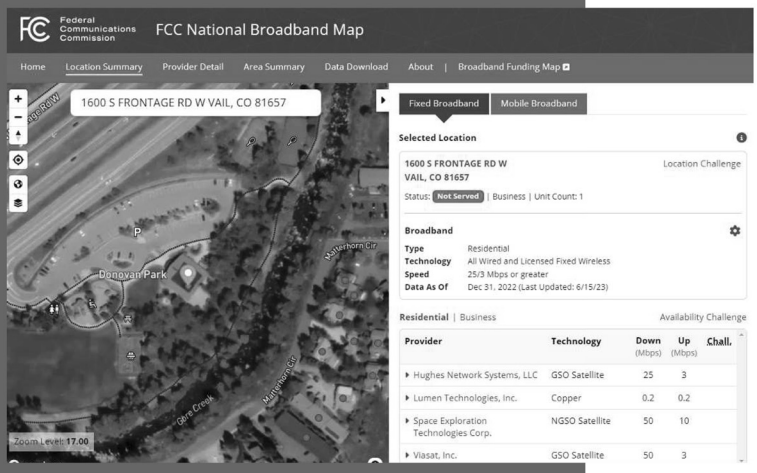
Beach Front Property in Massachusetts valued at over $8 million



Source: Federal Communications Commission National Broadband Map and Zillow.com

EXAMPLE 2:

$3.1 million Wedding Venue in Vail, Colorado



Source: Federal Communications Commission National Broadband Map and Instagram.com

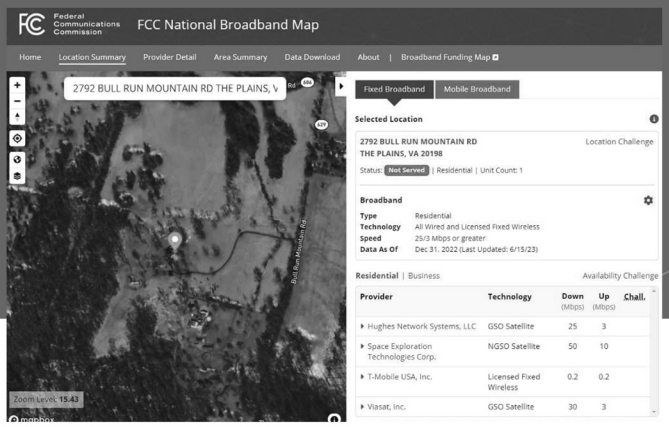
EXAMPLE 3:

10k square foot Mansion with Private Lake and Mountain Views

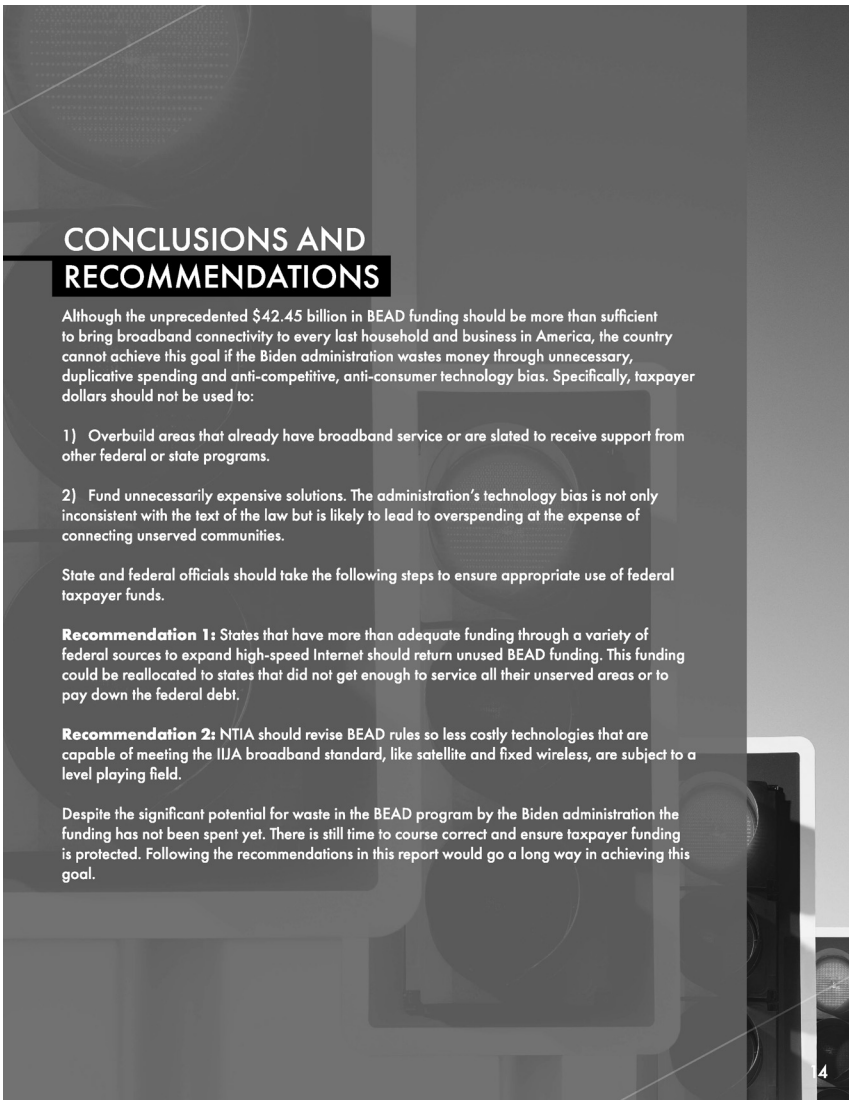
Source: Federal Communications Commission National Broadband Map and Zillow.com

EXAMPLE 4:

A 90 Acre Country Estate located just 90 minutes from Washington D.C.



Source: Federal Communications Commission National Broadband Map and Redfin.com



CONCLUSIONS AND RECOMMENDATIONS

Although the unprecedented $42.45 billion in BEAD funding should be more than sufficient to bring broadband connectivity to every last household and business in America, the country cannot achieve this goal if the Biden administration wastes money through unnecessary, duplicative spending and anti-competitive, anti-consumer technology bias. Specifically, taxpayer dollars should not be used to:

1) Overbuild areas that already have broadband service or are slated to receive support from other federal or state programs.

2) Fund unnecessarily expensive solutions. The administration's technology bias is not only inconsistent with the text of the law but is likely to lead to overspending at the expense of connecting unserved communities.

State and federal officials should take the following steps to ensure appropriate use of federal taxpayer funds.

Recommendation 1: States that have more than adequate funding through a variety of federal sources to expand high-speed Internet should return unused BEAD funding. This funding could be reallocated to states that did not get enough to service all their unserved areas or to pay down the federal debt.

Recommendation 2: NTIA should revise BEAD rules so less costly technologies that are capable of meeting the IIJA broadband standard, like satellite and fixed wireless, are subject to a level playing field.

Despite the significant potential for waste in the BEAD program by the Biden administration the funding has not been spent yet. There is still time to course correct and ensure taxpayer funding is protected. Following the recommendations in this report would go a long way in achieving this goal.

APPENDIX:

BROADBAND TABLES BY STATE

Table 1: Broadband Equity, Access, and Deployment (BEAD) Funding Among States by Number of Unserved Locations

Eligible Entity	Number of Unserved Locations	BEAD Allocation	Allocation per Unserved location
District of Columbia	184	$100,694,786.93	$547,254.28
Delaware	2,052	$107,748,384.66	$52,508.96
Virgin Islands	557	$27,103,240.86	$48,659.32
Rhode Island	2,309	$108,718,820.75	$47,084.81
American Samoa	1,783	$37,564,827.53	$21,068.33
North Dakota	7,988	$130,162,815.12	$16,294.79
Hawaii	11,671	$149,484,493.57	$12,808.20
Connecticut	11,693	$144,180,792.71	$12,330.52
Massachusetts	12,522	$147,422,464.39	$11,773.08
Alaska	88,185	$1,017,139,672.42	$11,534.16
Wyoming	39,215	$347,877,921.27	$8,871.04
Nevada	51,689	$416,666,229.74	$8,061.02
Northern Mariana Islands	10,331	$80,796,709.02	$7,820.80
New Hampshire	25,572	$196,560,278.97	$7,686.54
Utah	41,535	$317,399,741.54	$7,641.74
South Dakota	28,397	$207,227,523.92	$7,297.51
Vermont	33,646	$228,913,019.08	$6,803.57
Idaho	85,902	$583,256,249.88	$6,789.79
Maine	42,264	$271,977,723.07	$6,435.21
New Jersey	43,324	$263,689,548.65	$6,086.45
California	306,910	$1,864,136,508.93	$6,073.89
Maryland	44,411	$267,738,400.71	$6,028.65
Montana	104,534	$628,973,798.59	$6,016.93
New Mexico	114,997	$675,372,311.86	$5,872.96
Nebraska	70,478	$405,281,070.41	$5,750.46
Oregon	122,384	$688,914,932.17	$5,629.13

Table 1 (Continued)

Colorado	147,484	$826,522,650.41	$5,604.15
Arizona	177,325	$993,112,231.37	$5,600.52
Puerto Rico	61,871	$334,614,151.70	$5,408.26
Oklahoma	150,718	$797,435,691.25	$5,290.91
Washington	236,535	$1,227,742,066.30	$5,190.53
Kansas	87,489	$451,725,998.15	$5,163.23
Missouri	337,484	$1,736,302,708.39	$5,144.84
Iowa	83,509	$415,331,313.00	$4,973.49
Minnesota	135,984	$651,839,368.20	$4,793.50
Arkansas	215,621	$1,024,303,993.86	$4,750.48
South Carolina	119,580	$551,535,983.05	$4,612.28
Louisiana	296,777	$1,355,554,552.94	$4,567.59
Guam	34,489	$156,831,733.59	$4,547.30
Mississippi	268,365	$1,203,561,563.05	$4,484.79
West Virginia	271,624	$1,210,800,969.85	$4,457.64
New York	149,369	$664,618,251.49	$4,449.51
Tennessee	186,394	$813,319,680.22	$4,363.44
Illinois	239,688	$1,040,420,751.50	$4,340.73
Ohio	183,709	$793,688,107.63	$4,320.36
Indiana	202,021	$868,109,929.79	$4,297.13
Florida	272,962	$1,169,947,392.70	$4,286.12
Texas	779,378	$3,312,616,455.45	$4,250.33
Michigan	368,390	$1,559,362,479.29	$4,232.91
Alabama	331,206	$1,401,221,901.77	$4,230.67
Kentucky	259,258	$1,086,172,536.86	$4,189.54
Wisconsin	253,097	$1,055,823,573.71	$4,171.62
Pennsylvania	278,536	$1,161,778,272.41	$4,171.02
Georgia	315,780	$1,307,214,371.30	$4,139.64
North Carolina	376,039	$1,532,999,481.15	$4,076.70
Virginia	364,156	$1,481,489,572.87	$4,068.28
Total	8,489,371	$41,601,000,000.00	$4,900.36

Source: The number of unserved locations reflects the data used by the National Telecommunications and Information Administration to make BEAD allocations as proved to the committee. BEAD allocation amounts were publicly reported by the Biden administration on June 26, 2023. Allocation per unserved location is calculated by dividing the total allocation by the total number of unserved.

APPENDIX:

BROADBAND TABLES BY STATE

Table 2: Locations to be Served by Other Federal Funding Programs by State

State	Number of Unserved Locations	CPF Locations to be Served[a]	ReConnect Locations to be Served[b]	Remaining RDOF to be Served[c]	Remaining Unserved
Alabama	331,206	55,000	28,435	136,381	111,390
Alaska	88,185	0	6,200	0	81,985
American Samoa	1,783	0	0	0	1,783
Arizona	177,325	127,807	9,459	89,541	(49,482)
Arkansas	215,621	35,000	5,363	92,889	82,369
California	306,910	127,000	4,201	22,338	153,371
Colorado	147,484	18,000	5,886	26,561	97,037
Connecticut	11,693	10,000	0	78	1,615
Delaware	2,052	0	0	7,749	(5,697)
District of Columbia	184	N/A	0	0	184
Florida	272,962	48,400	0	100,169	124,393
Georgia	315,780	70,000	20,765	117,959	107,056
Guam	34,489	0	8,622	0	25,867
Hawaii	11,671	0	0	8,049	3,622
Idaho	85,902	35,000	936	11,510	38,456
Illinois	239,688	87,163	18,089	92,487	41,949
Indiana	202,021	55,349	2,036	80,975	63,661
Iowa	83,509	18,972	4,972	39,878	19,687
Kansas	87,489	21,300	4,365	43,257	18,567
Kentucky	259,258	45,000	9,170	77,221	127,867
Louisiana	296,777	88,500	4,081	140,640	63,556
Maine	42,264	22,500	443	13,085	6,236
Maryland	44,411	16,667	3,447	28,732	(4,435)
Massachusetts	12,522	16,000	0	1,458	(4,936)
Michigan	368,390	67,857	12,962	212,539	75,032
Minnesota	135,984	32,917	7,318	23,907	71,842
Mississippi	268,365	47,337	8,967	70,006	142,055
Missouri	337,484	37,979	39,738	88,793	170,974
Montana	104,534	61,100	3,096	16,506	23,832
Nebraska	70,478	21,000	604	14,487	34,387
Nevada	51,689	40,187	1,563	6,426	3,513
New Hampshire	25,572	24,000	0	11,170	(9,598)

Table 2 (Continued)

New Jersey	43,324	28,216	0	0	15,108
New Mexico	114,997	40,611	8,856	40,738	24,792
New York	149,369	100,000	8,478	19,610	21,281
North Carolina	376,039	78,100	31,714	124,644	141,581
North Dakota	7,988	3,965	5,063	1,115	(2,155)
Northern Mariana Islands	10,331	N/A	0	530	9,801
Ohio	183,709	15,000	1,217	130,991	36,501
Oklahoma	150,718	20,000	18,421	45,135	67,162
Oregon	122,384	N/A	9,371	41,520	71,493
Pennsylvania	278,536	44,000	237	97,690	136,609
Puerto Rico	61,871	N/A	1	0	61,870
Rhode Island	2,309	7,500	0	3,590	(8,781)
South Carolina	119,580	31,650	19,123	67,789	1,018
South Dakota	28,397	N/A	3,562	924	23,911
Tennessee	186,394	50,000	9,390	67,067	59,937
Texas	779,378	152,000	10,236	261,534	355,608
Utah	41,535	3,080	6,794	0	31,661
Vermont	33,646	13,818	1,554	16,907	1,367
Virgin Islands	557	N/A	0	0	557
Virginia	364,156	76,873	48,909	92,509	145,865
Washington	236,535	33,000	5,654	47,274	150,607
West Virginia	271,624	20,000	11,955	107,341	132,328
Wisconsin	253,097	8,000	746	135,559	108,792
Wyoming	39,215	11,700	659	9,268	17,588
Total	8,489,371	1,947,548	412,658	2,886,526	3,222,639

Table Notes: [a] For States and other eligible entities with "N/A," Treasury had not yet approved the state project(s) and awarded funding at the release of this report. For those states with "0" in this column, none of the awarded funding is going to last-mile broadband deployment.
[b] ReConnect publicly reports the number of households—not the number of locations—that will be served by funded projects. In some cases, these projects will also service small businesses and community anchor institutions but ReConnect does not consistently report these locations. As a result, this data likely underestimates the number of locations to be served by ReConnect. Further, data presented here does not include projects that included multiple states in their location counts as there is no practical way to determine, based on public reporting, how many locations are expected to be served in each state. Specifically, there are 16 projects across the four funding rounds that reported they will provide service to 15,190 households across multiple states.
[c] This column represents the remaining RDOF locations to be deployed. According to FCC published information, RDOF projects have already connected approximately 500,000 of the approximately 3.4 million funded locations. All reported "deployed" locations were subtracted from the total number of funded locations per state.

Senator BUDD. Thank you. And I yield back, Madam Chair.

The CHAIR. Thank you. I don't see Senator Sullivan. I know he wanted to ask questions, but I don't see them on the screen. So I am just going to ask a few and then wrap it up here so that you can get on to these meetings that you both have.

Secretary Raimondo, supply chain resiliency depends on security. So there is a lot of discussion around here in the last several months about how to best get that, particularly when you are—it could be backdoor attempts to information and communication technology, and data that can be used illegally for surveillance, or espionage, or various things.

We have looked at this issue and suggested—well, and had been suggested to us from the Administration that something like the GUARD Act, which would give Commerce—when we think about this information age in technology and export and import controls, one thing is clear: We need a little better tool on the control of flow of what could be a backdoor of information, or information that is just used in a way for purposes not friendly to our country, like illegal foreign surveillance.

So we are concerned about targeting of military members, their families, immigrants. What do you think we should do about this? And what do you think about the GUARD Act proposal?

Secretary RAIMONDO. I am very supportive of the GUARD Act proposal, I am often asked, should we outlaw TikTok? This is bigger than TikTok. Certainly, TikTok poses national security risks, to be clear. But we need a comprehensive plan to update. As you say, the threats are different today than they were 10 years ago. And so the right way to do this is to have—to empower us with a statutory set of tools to have a comprehensive approach to these connected apps that pose the national security risks, to say, TikTok, and others. And so I am supportive of attacking it in a comprehensive, statutory way.

The CHAIR. And so, appreciate that.

Director Panch, we are oversubscribed on the NSF side. We are oversubscribed. How do we from a—I suggest that we have more conversation about this, but how do we, from a scientific side, tell our colleagues on the Appropriations side that there is so much in the pipeline that could—I love all these questions about both where we go, because obviously the bill is about creating a distributed generation of R&D. And we already are pretty distributive, pretty competitive way better than a top-down model of say, other countries.

But I always say that two guys named Bill created our economies: Bill Boeing and Bill Gates, right? So you never know where the next Bill is going to come from.

Dr. PANCHANATHAN. Exactly.

The CHAIR. And so that is why we want a more distributed generation of R&D. But what are we going to do about the shortfall with our appropriators that there is so much in the pipeline that could be effective?

Dr. PANCHANATHAN. At so many levels. I am so glad, Chair Cantwell, you have been a strong supporter and a champion of the CHIPS and Science Act. And I know how hard you worked, so thank you very much. On behalf of the Science and Technology Community, we owe you a debt of gratitude, and all the folks that supported this.

So I just want to say that, let me take the basic research paradigm: 50,000 proposals, we fund 11,000 of them, 20,000 of them are being told that we should fund them. They are highly meritorious. We are leaving them on the chopping floor, which means a huge loss. And our competitors are taking advantage of that.

On the Regional Innovation Engines and Regional Technology Hubs that the Secretary talked about, they have 400 proposals. We had 700 proposals. And then we had another 130 proposals in type 2. We are not going to be able to fund all the top-quality proposals

that need to be invested in. These are ideas that are being left behind.

The CHAIR. Here is what I suggest, that we get an answer from the scientific community about the science necessary on these proposals. Like, yes, you get an A on your paper. It is definitely where we should be investing. But we don't have the resources.

Dr. PANCHANATHAN. Yes. Yes.

The CHAIR. That is what I think we need, not that we want some people to have failing grades on these proposals, but so that we are prioritizing and people can see that this is really needed.

OK. This hearing will remain open for—the record will remain open for 4 weeks, until November 1, 2023. Any senators liking to submit questions for the record can do so two weeks from now, by October 18. And we ask that responses to this be done by November 1.

So thank you to the witnesses, thank you to all our colleagues. We kind of had a double feature today in the Committee, but we had very good attendance at both, which I think it shows the interest of members, particularly this afternoon in this very important legislation. Thank you both for your tremendous leadership on America's competitiveness. We are adjourned.

[Whereupon, at 4:46 p.m., the hearing was adjourned.]

A P P E N D I X

United States Senate

February 1, 2023

The Honorable Dr. Sethuraman Panchanathan
Director
National Science Foundation
2415 Eisenhower Avenue
Alexandria, Virginia 22314

Dear Director Panchanathan:

The relationship between the United States and China stands at a critical crossroads. Now more than ever, competition between our two countries is driven by technology and poses threats to our national security and economic prosperity. It is essential that we maintain technological superiority and deter the growing economic influence of our largest competitor.

Congress took significant action toward this end with last year's passage of the CHIPS and Science Act (CHIPS Act). This law gives a prominent role to the National Science Foundation (NSF) in competing with China, and it is vital that the NSF implement the CHIPS Act quickly and in accordance with congressional intent to achieve our collective goal. NSF's implementation of the law will have real impacts on strategic technologies, specifically those relating to advanced energy and industrial efficiency.

As defined in statute, advanced energy technologies include innovations that "enhance the energy independence and security of the United States by enabling improved or expanded supply and production of domestic energy resources, including coal, oil, and natural gas" (42 U.S.C. 18632). In this spirit, advanced energy technologies and domestic energy production can and should be a central pillar in outcompeting China. We urge NSF to pursue *all* commercially available technologies as you implement the CHIPS Act, regardless of whether they are renewable or fossil-fuel based, in order to enhance U.S. energy and technology security for decades to come.

Russia's illegal war of aggression against Ukraine and its destructive effects on the global energy supply have only increased the need to engage responsibly with all forms of energy. A rapid transition to renewables would create unnecessary instability and leave millions of Americans without suitable alternatives to heat their homes and fuel their vehicles.

America's abundant energy resources are crucial to our national strategy. At a time when the international order is under threat from a number of adversaries, the United States must leverage all available tools and advantages to secure our interests, both at home and abroad. A speedy and faithful implementation of the CHIPS Act will go a long way toward ensuring the United States remains the preeminent leader in the world.

Sincerely,

Dan Sullivan
United States Senator

Roger F. Wicker
United States Senator

John Cornyn
United States Senator

Todd Young
United States Senator

NATIONAL SCIENCE FOUNDATION
March 30, 2023

Hon. DAN SULLIVAN,
United States Senate,
Washington, DC.

Dear Senator Sullivan:

Thank you for your letter of February 1, 2023, regarding the U.S. National Science Foundation's (NSF's) funding for research in advanced energy and industrial efficiency in support of our national security and global economic competitiveness.

With the passage of the CHIPS and Science Act of 2022, Congress put in place a roadmap for accelerating and expanding the Nation's research enterprise and creating opportunities for innovation in communities throughout the country. The law positions NSF to capitalize on the American research ecosystem comprised of academia, private industry, the Federal government, and other partners to quickly translate research in key technology areas into impacts that benefit the Nation. One of those key technologies is advanced energy, and NSF recognizes that our Nation's future depends on winning the research, innovation, translation and education race to transform the energy sector. NSF advances our energy future through investments in fundamental research that transforms energy systems and enables new energy industries; innovation to move discoveries to the market and society quickly; and education and workforce development, with a focus on preparing for the energy jobs of the future. NSF's energy investments complement and align with our investments in infrastructure resilience and sustainability.

NSF's investments in energy technology support high-risk, high-reward research ideas across the science and engineering spectrum that create broad new understanding and enable future innovations. For example, starting in the 1970s and 1980s, NSF provided support to Dr. John B. Goodenough and Dr. Stanley Whittingham for research that led to the development of the lithium-ion battery and was honored with a Nobel Prize in 2019.

Current investment in advanced energy research continues to expand scientific foundations to change paradigms and spawn innovations for our Nation's future energy supply, distribution, storage and use. They span a wide range of research that will lead to improvements in generation, conversion, storage, and distribution of electricity and fuels. NSF-funded researchers are pursuing breakthroughs in advanced energy sources, such as plasma-assisted ignition of hydrocarbon mixtures at the University of Texas at Austin; development of new energy materials; more efficient energy usage, including industrial efficiency; understanding social, behavioral, and economic aspects such as barriers and opportunities for technology adoption; as well as research related to infrastructure and systems, such as sustainable transit/vehicle technologies, building efficiency, sustainable computing, decarbonized manufacturing, and interconnected natural, human-built, and social systems.

NSF supports transformative, large-scale research on foundational and use-inspired challenges through programs for Centers for Chemical Innovation, Expeditions in Computing, Engineering Research Centers, Industry-University Cooperative Research Centers, and others. NSF-funded research centers play a key role in bringing researchers together to tackle challenges across the innovation landscape, including in advanced energy. For example, researchers at NSF's Engineering Research Center (ERC) led by Utah State University with Purdue University, the University of Colorado, and the University of Texas at El Paso are developing technologies for roadway electrification, and an ERC led by Purdue University is working on conversion of light hydrocarbons to chemicals and transportation fuels.

With our investments in unique funding opportunities and partnerships that foster co-design, co-creation, piloting, and prototyping, NSF also accelerates the translation of research results to the market and society, catalyzing a broad spectrum of advanced energy technologies and systems. NSF speeds translation of fundamental discoveries in advanced energy into technologies and systems through center programs with industry partners and through the NSF Lab-to-Market Platform comprising Partnerships for Innovation, NSF Innovation Corps (NSF I-Corps™), and the Small Business Innovation Research and Small Business Technology Transfer (SBIR/STTR) programs. NSF-funded small businesses are developing technologies and materials for new batteries, lithium battery recycling, carbon dioxide conversion, advanced solar, fusion and electromagnetics, and technologies that reduce energy intensity and resources. For example, Syzygy Plasmonics, an NSF-funded small business, is developing a photocatalytic reactor designed to electrify chemical manufacturing. The Houston-based company's reactor is powered by light in-

stead of heat and operates at a lower temperature than conventional chemical reactor technology.

NSF will continue to attract, inspire, educate, train and reskill/upskill individuals, from K–12 to college and industry, to grow a diverse and engaged advanced energy across the Nation. For example, the Advanced Technological Education Network for Utilities and Energy Technical Education project at Northeast Wisconsin Technical College seeks to address current and anticipated utility and energy industry workforce and training needs. This project is supported by the NSF Advanced Technological Education (ATE) program, which supports the education of technicians for the high-technology fields that drive our Nation's economy, with a focus on two-year institutions of higher education.

We greatly appreciate your interest in the work of the National Science Foundation. Please feel free to contact Amanda Hallberg Greenwell, Head of the Office of Legislative and Public Affairs, at (703) 292-8070 if you have any additional questions.

Sincerely,

SETHURAMAN PANCHANATHAN,
Director.

Identical letter to:
The Honorable Roger F. Wicker
The Honorable John Cornyn
The Honorable Todd Young

ASSOCIATED BUILDERS AND CONTRACTORS
October 4, 2023

Hon. MARIA CANTWELL,
Chair,
U.S. Senate Committee on Commerce,
Science, and Transportation,
Washington, DC.

Hon. TED CRUZ,
Ranking Member,
U.S. Senate Committee on Commerce,
Science, and Transportation,
Washington, DC.

Chairman Cantwell, Ranking Member Cruz and Members of the U.S. Senate Committee on Commerce, Science, and Transportation:

On behalf of Associated Builders and Contractors, a national construction industry trade association with 68 chapters representing more than 22,000 member companies, we thank you for holding the hearing, "CHIPS and Science Implementation and Oversight."

As the committee continues to lead Congress' oversight of the implementation and oversight of the CHIPS and Science Act by the U.S. Department of Commerce and the National Science Foundation, ABC will comment on specific policies that the department is pursuing outside of congressional authorization/intent.

Implementation of the CHIPS and Science Act and Project Labor Agreements

The CHIPS and Science Act provides $39 billion in Federal grants, loans and loan guarantees to rebuild America's semiconductor manufacturing capacities and allows companies a 25 percent advanced manufacturing investment tax credit.

We are concerned with the Department of Commerce National Institute of Standards and Technology's promotion of policy[1] that seems to give priority consideration to private-sector stakeholder applications for the CHIPS Incentives Program's Commercial Fabrication Facilities Notice of Funding Opportunity,[2] which pledges to require its construction contractors to execute a project labor agreement with various construction trade unions while building a semiconductor manufacturing facility.

A PLA preference policy in the Department of Commerce's grant program could undermine congressional authority, as the bipartisan CHIPS and Science Act contained no such language and jeopardizes public investment in semiconductor manufacturing facilities. Its inclusion will further exacerbate a shortage of construction industry skilled labor; discourage competition from quality large, small and disadvantaged construction businesses; and needlessly increase construction costs for applicants at the expense of taxpayers and national trade and security objectives.

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[1] See page 21 of the Commerce Department's National Institute of Standards and Technology's CHIPS Incentives Program—Commercial Fabrication Facilities—Notice of Funding Opportunity 2023-NIST-CHIPS-CFF-01, released Feb. 28, 2023: *https://www.nist.gov/system/files/documents/2023/02/28/CHIPS-Commercial_Fabrication_Facilities_NOFO_0.pdf.*

[2] See *https://www.nist.gov/chips/notice-funding-opportunity-commercial-fabrication-facilities.*

A PLA is a jobsite-specific collective bargaining agreement unique to the construction industry that typically requires companies to agree to recognize unions as the representatives of their employees on that project, use the union hiring hall to obtain most or all construction labor, exclusively hire apprentices from union programs, follow union work rules and pay into union benefit and multiemployer pension plans that nonunion employees could not access. This forces employers to pay "double benefits" into their existing plans and union plans, puts them at a significant competitive disadvantage and exposes them to unfunded multiemployer pension plan liabilities. In addition, PLAs typically require construction workers to pay union dues and/or join a union if they want to receive union benefits and work on a PLA project. If they do not satisfy these stipulations, nonunion workers lose an estimated 34 percent of their wages and benefits to union coffers and benefits plans—making them the victims of wage theft.[3]

When mandated as a result of government policy, PLAs exacerbate the construction industry's estimated skilled labor shortage of more than half a million workers in 2023[4] by unfairly discouraging competition from quality nonunion contractors and their employees, who comprise 88.3 percent of the private U.S. construction industry.[5]

In addition, PLAs can interfere with existing union collective bargaining agreements. This may prevent some unionized firms from competing for a project, because they are prohibited from using labor from signatory unions not included in the jobsite's PLA, which is why some union organizations and contracting groups oppose government-mandated PLAs.

Multiple studies of hundreds of taxpayer-funded affordable housing[6] and school construction[7] projects found that government PLA mandates increase the cost of construction by 12 percent to 20 percent compared to similar non-PLA projects already subjected to prevailing wage regulations.

Simply put, hardworking taxpayers could get less and pay more as a result of pro-PLA policies. In contrast, taxpayer dollars are spent responsibly by letting the market determine if a PLA is appropriate and fostering fair and open competition among the best contractors and skilled workers in America.

While ABC outright opposes the NOFO's PLA preference policy, we appreciate the NOFO's inclusion of an alternative in the form of workforce continuity plans.[8] We urge the Department of Commerce to clarify whether developers who utilize this PLA requirement alternative would be penalized in their application process and if preference would be given to those applications with PLAs included. As outlined above, the department must consider the negative impacts on competition and industry labor challenges that discouraging more than 88 percent of the construction workforce from competing on CHIPS Act projects would cause.

Effects of the CHIPS Act's Restrictive Labor Requirements

On Aug. 8, 2023, the U.S. Department of Labor released a final rule, *Updating the Davis-Bacon and Related Act Regulations,* which makes drastic revisions to the Davis-Bacon Act and Related Acts regulations that apply to Federal and federally assisted construction projects funded by taxpayers.

The DOL's final rule, effective Oct. 23, 2023, mostly disregards the *feedback of ABC* contractors, construction industry stakeholders and thousands of small busi-

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[3] McGowan, John R., Ph.D., CPA, *Government-Mandated Project Labor Agreements Result in Lost and Stolen Wages for Employees and Excessive Costs and Liability Exposure for Employers,* October 2021.

[4] See *www.abc.org/wfshortage.*

[5] See bls.gov Union Members Summary, Jan. 19, 2023, *https://www.bls.gov/news.release/union2.t03.htm.*

[6] Ward, Jason M., The Effects of Project Labor Agreements on the Production of Affordable Housing: Evidence from Proposition HHH. Santa Monica, California. RAND Corp., 2021. *https://www.rand.org/pubs/research_reports/RRA1362-1.html.*

[7] See five studies, available at *https://buildamericalocal.com/learn-more/#gmpla-studies,* measuring the impact of PLA mandates on public school construction already subject to state prevailing wage laws in Connecticut (2020), Massachusetts (2006), New Jersey (2019), New York (2006) and Ohio (2017) by the Beacon Hill Institute (*http://beaconhill.org/labor-economics/*); an October 2010 report by the New Jersey Department of Labor and Workforce Development, Annual Report to the Governor and Legislature: Use of Project Labor Agreements in Public Works Building Projects in Fiscal Year 2008 (*https://www.nj.gov/labor/forms_pdfs/legal/2010/PLAReportOct2010.pdf*); and a 2011 study by the National University System Institute for Policy Research, Measuring the Cost of Project Labor Agreements on School Construction in California (*http://www.nusinstitute.org/assets/resources/pageResources/Measuring-the-Cost-of-Project-Labor-Agreements-on-School-Construction-in-California.pdf*).

[8] See page 53 and 54 of the NOFO under part b. Construction Workforce Plan: *https://www.nist.gov/system/files/documents/2023/06/23/CHIPS-Commercial%20Fabrication%20Facilities%20NOFO%20Amendment%201.pdf*

nesses urging the withdrawal of this unnecessary, costly and burdensome regulation. Instead, the DOL is moving forward with dramatic changes to prevailing wage regulations, reversing much-needed reforms and unlawfully increasing the regulatory burden on small businesses, new industries and public works projects.

Included in the legislative language of the CHIPS and Science Act—unlike the PLA issue noted above—Davis-Bacon Act requirements will have *inflationary* and anti-competitive effects on projects. Less competition from small businesses and nonunion firms caused by the misguided inclusion of Davis-Bacon requirements—coupled with the recent controversial Davis-Bacon Act rulemaking—will result in less return on investment in taxpayer dollars and could lead to project delays.

The Department of Commerce must consider the unnecessary cost increases that will be imposed by existing Davis-Bacon Act requirements. Additionally, ABC urges the department to consider the impacts the numerous, drastic changes imposed by the August 2023 Davis-Bacon rule on the costs of the projects funded by the CHIPS and Science Act and how the new regulation may restrict the ability of small businesses' opportunities to compete on those projects.

Thank you for your consideration of ABC's concerns.

Sincerely,

KRISTEN SWEARINGEN,
Vice President, Legislative & Political Affairs.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO HON. GINA M. RAIMONDO

CHIPS Supply Chain

One of the most critical reasons we passed CHIPS was because of the semiconductor shortages spurred by the 2020 pandemic. Lifesaving medical devices like pacemakers couldn't get chips. Consumers saw car prices rise as much as 40 percent. In the State of Washington State, truck manufacturer PACCAR was forced to leave unfinished trucks in the lots because they didn't have access to semiconductors. That's why Congress acted to invest in reshoring production of semiconductors.

Question 1. How is the Department using CHIPS funds to ensure a future pandemic, natural disaster, or other crisis won't cripple our supply chains?

Answer. While COVID–19 was unprecedented, it revealed structural problems with semiconductor supply-chain management that will endure unless actively addressed. Firms both upstream and downstream of chipmakers typically have limited visibility into their supply chains, often having knowledge of only their immediate customers and suppliers. Purchasing often involves the use of third-party distributors and short-term purchase contracts. These features make it difficult for companies to assess supply chain risks and to diagnose and address shortages as they arise. In addition, current generation and mature-node production is geographically concentrated, with East Asia accounting for the majority of global capacity in the legacy space and the Chinese government actively subsidizing additional investment in legacy production.

As outlined in the Commerce Department's "Vision for Success: Commercial Fabrication Facilities" paper, the Department's four strategic objectives include:

- First, for leading-edge logic, our goal is to both design and produce the most advanced chips here, in the United States, by the end of the decade. Right now, we manufacture zero of the world's most advanced chips on our shores. Specifically, by the end of the decade, the United States will have at least two new large-scale clusters of leading-edge logic fabs, with each cluster including multiple commercial-scale fabs, a large and skilled workforce, nearby suppliers, R&D facilities, and specialized infrastructure.
- Second, the United States will be home to multiple high-volume advanced packaging facilities. Packaging–the process of putting fabricated chips into containers that will ultimately be embedded in products–is an essential part of the manufacturing process, and one that will be core to new innovations in functionality and efficiency.
- Third, U.S.-based fabs will produce high-volume Dynamic Random-Access Memory (DRAM) memory chips on economically competitive terms.
- And fourth, the United States will have increased its production capacity for the current-generation and mature chips that are vital to U.S. economic and national security.

CHIPS Underfunded

The CHIPS and Science Act authorized nearly $250 billion in investments for manufacturing, research, and development which is critical for the U.S. to continue to be the world leader in innovation and competition. But we've seen in just the last year that these authorization levels haven't been matched by appropriations.

A report from the Federation of American Scientists shows that the Fiscal Year 2023 omnibus appropriations bill fell short of CHIPS levels by $3 billion, and the Fiscal Year 2024 appropriations are expected to fall short by nearly $7.5 billion. The authorization levels in this Act are critical to ensuring our future success. That's why I led a letter to the Appropriators asking them to fully fund CHIPS and Science programs.

Question 1. What will the consequences be for U.S. leadership in science, technology, and innovation if appropriations don't match the levels authorized in CHIPS and Science?

Answer. The Department's ability to use the already-authorized funding to implement research and development provisions of the CHIPS and Science Act is dependent on the enactment of an annual appropriations act, which makes available a new tranche of funding for obligation in each Fiscal Year. The research, innovation, and manufacturing sparked by this historic law can enable the United States to be the world's technological superpower, securing our economic and national security future for the coming decades.

To fulfill the promise of the CHIPS and Science Act and ensure that the United States leads the world in critical and emerging technologies, we need robust, sustained investments. For example, the CHIPS and Science Act reauthorized the National Institute of Standards and Technology (NIST) through 2027, codifying existing programs and establishing new programs and activities. The authorization levels in the CHIPS and Science Act for NIST include a total of $1.55 billion in Fiscal Year (FY) 2023. The FY 2023 Omnibus spending bill provided NIST $1.23 billion (not including earmarks) leaving approximately $320 million in unfunded research promotes U.S. competitiveness as other countries are ramping up their investments in critical and emerging technologies. Funding requested in the Commerce Department's FY 2025 budget for implementation of certain CHIPS and Science Act provisions that were authorized but not appropriated include:

- *Artificial Intelligence (+$47.7 million)* to invest in the United States AI Safety Institute and expand upon Executive Order 14110 to conduct AI research, establish testing infrastructure and advance methods to create benchmarks and measurements for AI system evaluation, develop technical guidance and facilitate the development of standards and implement best practices and frameworks.
- *Quantum Information Science (+$13.9 million)* to identify post-quantum cryptography, develop measurements for large-scale quantum systems, identify and mitigate limiting factors for high-performance quantum computers, train a quantum-ready workforce, and ensure a leadership role in global quantum standards development.

As part of the Department's commitment to creating good-paying jobs and ensuring that no community is left behind, another key element of the CHIPS and Science Act is the Distressed Area Recompete Pilot Program (Recompete), housed in the Economic Development Administration (EDA). Recompete targets the hardest-hit and most economically distressed communities where prime-age (25–54 years) employment is significantly lower than the national average, with the goal to close this gap through flexible, locally-driven investments. The Recompete program aims to catalyze long-term economic opportunity through these investments that target the unique underlying conditions of a particular place. Through its bottom-up, community-driven approach, Recompete will provide employment opportunities in concentrated areas. Through a two-phase competition, Recompete will provide transformational investments of approximately $20-$50 million to 4–8 communities across the country.

In December of last year, EDA announced 22 Recompete Finalists located across 20 states and Territories that represent a cross-section of urban and rural regions. Phase 2 investments will range from $20–$50 million and can be used to support a wide range of implementation activities across workforce development, business and entrepreneur development, infrastructure, and additional planning, predevelopment, or technical assistance. EDA also awarded 24 Strategy Development Grants (SDG) to help communities significantly increase local coordination and planning activities. Such development could make selected grantees more competitive for any future Recompete funding.

The FY 2024 President's Budget requests another $200 million of Recompete's authorized funding level. This would allow EDA to make more grant awards to communities that have been for too long been forgotten through future rounds of the program in areas like workforce training, small business supports, infrastructure investments, and other critical investments to move the needle.

The Economic Development Administration's Regional Technology and Innovation Hubs (Tech Hubs) program is working to create regional innovation centers across the country by bringing together industry, higher education institutions, state and local governments, economic development organizations, and labor and workforce partners to supercharge ecosystems of innovation for technologies that are essential to our national security and economic competitiveness. The Tech Hubs program is a key part of President Biden's Investing in America agenda, stimulating private sector investment, creating good-paying jobs, revitalizing American manufacturing, and ensuring no community is left behind by America's economic progress.

Through the Tech Hubs program, the Department is committed to strengthening economic and national security by advancing the capacities of regions to manufacture, commercialize, and deploy these technologies, guided by the following priorities: 1) making more U.S. regions strong competitors in the global innovation economy; 2) building strong communities that share in the prosperity technological innovations bring; 3) spurring the creation of new good jobs and other opportunities for workers at all skill levels; and 4) strengthening and increasing the resilience of the supply chains that our innovative technology-centric industries rely on to stay secure and competitive.

On October 23, 2023, EDA announced the winners of Phase 1 of the Tech Hubs program, and posted the Notice of Funding Opportunity for Phase 2. This announcement included 31 designated Tech Hubs across 32 states and Puerto Rico, as well as the 29 consortia that will receive Strategy Development Grants. The 31 designated Tech Hubs focus on developing and growing innovative industries in regions across the country, including semiconductors, clean energy, critical minerals, biotechnology, precision medicine, artificial intelligence, quantum computing, and more. The Department is grateful to Congress for the $500 million in appropriations that we received in FY 2023 to catalyze investment in technologies critical to economic growth, national security, and job creation, and help communities across the country become centers of innovation critical to American competitiveness.

This amount, however, represents only five percent of the $10 billion that was authorized through the CHIPS and Science Act. At this funding level, EDA is only able to invest approximately $40–70 million in each of approximately 5–10 Hubs, while the authorization envisions investments of hundreds of millions and up to $1 billion in 20 or more Hubs across the country. Based on the level of interest EDA saw in Phase 1—nearly 400 applications, including nearly 200 seeking to compete for these large investments—demand exceeds our currently available funds by 100x when considering both applications received and maximum possible investment levels.

At current funding levels, not every deserving, high-potential applicant will be designated a Tech Hub or receive funding. The President's budget requests the next $4 billion of the authorized level, putting EDA on track to invest more funding in more Hubs through future rounds of the program so regions can create and implement innovation-based growth strategies and access the concentrated investments that will unlock solutions to grand challenges, equitably increase individual prosperity, and strengthen U.S. global competitiveness.

Manufacturing USA Institutes

The CHIPS and Science Act and Fiscal Year 2023 Omnibus Appropriations bill authorized and funded new Manufacturing USA ("MUSA") Institutes through the Department of Commerce and the National Institute of Standards and Technology ("NIST").

The legislation also directs the Department to pursue geographic diversity—there are currently no MUSA institutes in the Pacific Northwest, and only 3 west of the Mississippi.

In August, I wrote to the Department and NIST about ensuring a successful selection of a new MUSA Institute. And in January, I wrote a letter calling for a Manufacturing USA Institute to help research, develop, and rapidly translate new aerospace materials technologies to market and to train the domestic manufacturing workforce necessary to make this possible. In my state alone, we are looking at a 60,000 STEM worker shortfall by 2026, with significant shortages in the aviation and space sector, particularly in machinists.

Question 1. I believe that collaboration between NIST, Labor, and industry is needed to keep the U.S. competitive in advanced manufacturing and to train the modern aerospace workforce. Will you commit to working on this issue and pushing

for new facilities for advanced aerospace materials, manufacturing, and workforce development?

Question 2. The CHIPS and Science Act and the Fiscal Year 2023 omnibus appropriations bill provide funding for up to 3 new semiconductor-focused MUSA institutes, as well as an additional NIST-funded MUSA institute. More than a year later, the Department has not yet announced funding opportunities for new Institutes that are greatly needed for our Nation's competitiveness and leadership in advanced manufacturing. Can you share with us when the Department of Commerce is expected to announce the funding opportunities for both the semiconductor and additional MUSA institutes? What are the expected timelines for evaluation and award selection as well?

Answer. The Department of Commerce is committed to helping more American workers compete and win in the 21st century global economy. NIST intends to announce a funding opportunity in Spring 2024 for a new Commerce Department-sponsored Manufacturing USA institute focused on the use of AI to improve resilience of U.S. manufacturing. The institute will be funded using the FY 2023 omnibus appropriations.

In addition, in January, the Department of Commerce issued a Notice of Intent to announce a competition for a new CHIPS Manufacturing USA Institute. CHIPS for America is investing at least $200 million in this CHIPS Manufacturing USA Institute to create the first-of-its-kind digital twin institute to lead the world in revolutionizing semiconductor and advanced packaging manufacturing. The CHIPS Manufacturing USA Institute will foster a collaborative environment to significantly expand innovation, bring tangible benefits to both large and small-to-medium-sized manufacturers, strengthen diverse research institutions, and ensure a national reach in workforce development. The new institute will have both regionally focused programs and meaningful cross-region participation. This nationwide model will best meet the CHIPS R&D program goals of strengthening U.S. technology leadership, accelerating ideas to market, and realizing a robust semiconductor workforce.

CHIPS for America expects to announce the competition for the new Manufacturing USA Institute via a Notice of Funding Opportunity (NOFO) in the second quarter of calendar year 2024.

Finally, NIST has issued a NOFO for Manufacturing USA Workforce, Education and Vibrant Ecosystems (WEAVE) public service awards to the 17 Manufacturing USA institutes designed to engage Historically Black Colleges and Universities, other Minority Serving Institutions, and rural serving institutions of higher education. NIST has reviewed applications and anticipates awards will be announced in early 2024.

Germanium and Gallium/Impacts on Semiconductors

China restricted exports of germanium and gallium citing national security. China put the restrictions in place after the U.S. put new export controls on advanced semiconductors and semiconductor tools destined for China.

Germanium is used as a transistor in thousands of electronic applications and in optical coatings the solar industry needs. Gallium is used in manufacturing semiconductors.

China produces around 60 percent of germanium over 90 percent of the world's gallium. Germanium is also produced in Canada, Finland, and the United States. Europe, Japan, and Canada produce some gallium.

Question 1. How is the Department of Commerce working with the Biden administration to ensure the private sector has access to supplies of germanium and gallium needed for semiconductor production? How are you working with like-minded allies and foreign partners to de-risk and strengthen supply chain resilience?

Question 2. Could you speak more about the Department of Commerce's strategy to ensure a stable and resilient supply of critical materials for the semiconductor industry? How are you coordinating with the U.S. Department of State and other agencies and departments to ensure successful implementation of the CHIPS Act?

Question 3. What do you need from Congress to support these efforts?

Answer. The Department is working on multiple fronts to advance the Biden administration's priorities to support resilient and secure supply chains of critical minerals and metals like gallium and germanium. We must ensure that international trade in minerals is fair and that domestic mineral processing is expanded, and we should develop a circular economy where key minerals are extracted from end-of-life electronics and manufacturing scrap. Toward these ends, Commerce has already launched a new Industry Trade Advisory Committee on Critical Minerals and Non-Ferrous Metals and is working with allies through working groups with Australia, Brazil, Canada, the European Union, and Japan to engage industry. We also partici-

pate in certain United Nations International Metals Study Groups. Commerce is also engaging industry across the gallium and germanium value chain to identify key needs and concerns and assess impacts of foreign trade actions, as well as determine how gallium and germanium end-users can diversify their supply chains away from single sources and regions of high geopolitical concern.

Recognizing the national security imperative of investments in the domestic semiconductor industry, the Departments of Commerce and Defense in July announced a Memorandum of Agreement (MOA) to expand collaboration to strengthen the U.S. semiconductor defense industrial base. The agreement increases information-sharing between the Departments to facilitate close coordination on the CHIPS for America's incentives programs, including collaboration on potential investment applications to ensure that our departments are making complementary decisions that maximize Federal investments under the CHIPS Incentive Program and the Department of Defense's (DoD) Defense Production Act and Industrial Base Analysis and Sustainment funds. This alignment of priorities and decision-making will help ensure that our respective investments position the United States to produce semiconductor chips essential to national security and defense programs.

Gallium and germanium are important examples among the critical minerals that the CHIPS program is focused on in partnership with the critical minerals team in International Trade Administration (ITA) and other agencies. Direct support is available to semiconductor materials facilities via the first and second notices of funding opportunities. The CHIPS office is also partnering with the leading semiconductor manufacturing firms to better understand and support their world class supply chains and business continuity programs.

Analyzing critical supply chains to identify potential chokepoints before they become crises—going from reactive to proactive—is being prioritized. After receiving an initial $10.8 million appropriation in Fiscal Year 2023, the Commerce Department's Industry and Analysis (I&A) unit in ITA launched the U.S. Government's first Supply Chain Center to serve as the analytic engine for supply chain resilience policy action within the U.S. Government. The FY 2024 Budget Request seeks $21 million to scale these efforts and institutionalize this important work within Commerce. The Supply Chain Center builds on I&A's mission to enhance the competitiveness of U.S. companies and protect U.S. national security by being: (1) proactive in getting ahead of supply chain challenges with analytic frameworks, deep dives, policy playbooks, and persistent scanning for vulnerabilities; (2) strategic in setting priorities for policy focus and action based on data-driven risk analysis; (3) a force multiplier in improving the targeting and effectiveness of U.S. Government investments; and (4) a partner to industry in building resilient supply chains and ensuring U.S. businesses lead the industries of the future.

ITA is also seeking to expand SelectUSA services to coordinate supply chain priorities with state Foreign Direct Investment (FDI) attraction efforts and recruit high-value investment targets in alignment with supply chain strategies. The FY 2024 Budget seeks $4.75 million for ITA to expand its investment promotion tool kit to target high-value investments in coordination with U.S. states, which would dramatically improve SelectUSA's ability to attract investment into the United States. In addition, ITA will conduct the analysis required to use the specialized expertise and firm-level data needed to develop better strategies for attracting specific individual firms to the United States. Lastly, the requested funds will bolster the Advocacy Center, which works the U.S. businesses to win foreign government public tenders, reflecting the importance of global markets to maintaining the viability of key domestic suppliers.

This request is the Global Markets component of an ITA joint proposal with the Industry and Analysis business unit. Global Markets will leverage the analysis, strategies, and recommendations produced by Industry and Analysis under its complementary request to better target FDI toward reducing critical, national supply chain risks.

The NIST Manufacturing Extension Partnership (MEP) helps businesses narrow gaps in our supply chains and make manufacturing more resilient. NIST's Manufacturing USA program intends to make available competitive awards to enable existing Manufacturing USA institutes to transition technologies developed at the institutes into domestic production.

Altogether, these investments in critical technologies and regions are essential to maintaining American technological leadership in the world and outcompeting the People's Republic of China (PRC) in a 21st century global economy.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. TAMMY BALDWIN TO HON. GINA M. RAIMONDO

The Department of Commerce's March 22, 2023 preliminary determination in its self-initiated circumvention inquiry into imports of aluminum foil from South Korea and Thailand imposes substantial duties on thin-gauge or "converting" aluminum foil that is essential for food, pharmaceutical, and medical device packaging. I am concerned that these duties not meet the intent of anti-dumping measures, harming American manufacturers instead of protecting them.

Question 1. Will you consider exempting thin-gauge aluminum foil in DOC's final determination on this issue? If not, will you consider providing an end-use certification exemption for flexible packaging manufacturers and other U.S. importers of thin-gauge aluminum foil?

Answer. Commerce's enforcement and compliance proceedings are bound by statute and regulation to protect American businesses and workers from unfair trade. Commerce currently administers antidumping and countervailing duties (AD/CVD) orders on imports of aluminum foil from China pursuant to longstanding U.S. law designed to negate the unfair advantage of injurious foreign government subsidies and unfair pricing (*i.e.,* dumping) of goods in the U.S. market. As part of that underlying investigation, the International Trade Commission determined that unfairly subsidized and priced imports of aluminum foil from China harm the U.S. domestic industry. Circumvention inquiries are a critical component to a robust trade enforcement regime because they ensure that AD/CVDs are not undermined and continue to support U.S. workers and businesses in the face of unfair trade. Lastly, it is important to clarify that Commerce is directed by law to consider only the statutory and regulatory factors as part of its circumvention analysis and cannot consider additional factors, such as other domestic industries that may require the product as an input. On November 20, 2023, Commerce announced its final determinations that imports of Chinese-sourced aluminum foil that are assembled or completed in Korea or Thailand are circumventing the AD/CVD orders on aluminum foil from China. Be assured that all parties' comments were fully taken into consideration for the final determinations, including arguments regarding the inclusion of thin gauge converter aluminum foil within the scope of the orders and certification requirements for flexible packaging manufacturers.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. TAMMY DUCKWORTH TO HON. GINA M. RAIMONDO

Ally Engagement on Export Controls

One early success in the Biden administration's efforts to protect national and economic interests was our agreement with Japan and the Netherlands to ensure those two countries adopt policies that mirror U.S. policies in restricting the export of chip manufacturing technologies to the People's Republic of China (PRC).

Recently, however, Huawei unveiled the Mate 60 Pro smartphone, which uses 7 nanometer chips. This development highlights the importance of continuous work to improve export controls and affirms the importance of expanding cooperation with close allies and partners.

Question 1. Please provide the U.S. Department of Commerce's assessment of the effectiveness of our Nation's current export controls on chip manufacturing technologies.

Question 2. Please provide the Department's recommendations for actions that Congress could take to enhance the Department's ability to ensure the United States cooperates with partners to better counter the PRC's efficiency and speed in developing and adopting cutting-edge technologies.

Answer. The October 7, 2022 advanced computing and semiconductor manufacturing equipment rule issued by the Commerce Department's Bureau of Industry and Security (BIS) imposed restrictions on the PRC's access to certain advanced semiconductor manufacturing equipment, chips and other items needed to develop A.I. and prohibited U.S. persons from supporting chip development and production that power A.I. systems at certain semiconductor fabrication facilities located in the PRC or Macau without a license.

The rule was released as an interim final rule and is in effect. According to public reporting, the regulation has restricted the PRC's ability to indigenously produce advanced semiconductors that threaten U.S. national security and foreign policy interests. However, we know that the PRC is looking for ways to continue accessing these high-end chips and the equipment needed to manufacture them, and we are aware of public reporting regarding purported advances by a PRC company in cer-

tain chips. In this evolving technological landscape and threat environment, BIS continues to review different sources of information, including classified, business proprietary, and open source information, to understand the character and composition of any purported advances in PRC companies' production of certain chips, address circumvention attempts, and track the impact of U.S. controls and be proactive and nimble when new information surfaces.

On October 17, 2023, the BIS released rules designed to update export controls on advanced computing semiconductors and semiconductor manufacturing equipment, as well as on items that support supercomputing applications and end-uses, to arms embargoed countries, including the PRC. BIS also placed additional Chinese entities on the Entity List for their involvement in the development of advanced computing integrated circuits. These rules reinforce the objective of the October 7, 2022, controls to restrict the PRC's ability to both purchase and manufacture certain high-end chips critical for military advantage.

The Advanced Computing Chips Interim Final Rule retains the stringent PRC-wide licensing requirements imposed in the October 7, 2022, rule and makes two categories of updates by: (1) adjusting the parameters that determine whether an advanced computing chip is restricted; and (2) imposing new measures to address risks of circumvention of the controls.

The Expansion of Export Controls on Semiconductor Manufacturing Items Interim Final Rule: (1) imposes controls on additional types of semiconductor manufacturing equipment; (2) refines and better focuses the U.S. persons restrictions while codifying previously existing agency guidance, to ensure U.S. companies cannot provide support to advanced PRC semiconductor manufacturing, while avoiding unintended impacts; and (3) expands license requirements for semiconductor manufacturing equipment to apply to additional countries beyond the PRC and Macau, to 21 other countries for which the U.S. maintains an arms embargo.

The third rule issued on October 17, 2023 adds to the Entity List two PRC entities and their subsidiaries (a total of 13 entities) involved in the development of advanced computing chips that have been found to be engaged in activities contrary to U.S. national security and foreign policy interests. These entities will also be subject to restrictions on foreign-produced items made with U.S. technology. In addition, foundries producing chips for these listed parties will need a BIS license before the foundries may send such chips to these entities or parties acting on behalf of these entities as a result of applying the "footnote 4" Entity List foreign direct product rule designation.

In addition, as you point out, it is imperative that the United States and our allies safeguard our core technologies by continuously and proactively reviewing and updating our export control policies in order to protect foundational technologies. The U.S. government will continue to assess the national security environment and is in constant communication with like-minded international partners and allies regarding issues of mutual security concern.

The President's FY2024 proposed budget provides BIS's Export Administration (EA) with the resources necessary to sustain its effective work across its areas of responsibility, including the evaluation of the families of technologies outlined by the National Security Advisor, as well as others.

BIS is working to implement a reorganization of EA that will help to address its substantially growing responsibilities and ensure that the national security and economic policy priorities identified under Export Control Reform Act of 2018 are met effectively and expeditiously.

Export Controls—Taiwan and South Korea

South Korean and Taiwanese chipmakers are understandably reluctant to curb investments in China, which on purchasing power alone, is an important marketplace for manufacturers based in those two respective countries.

Question 1. What is the U.S. Department of Commerce's long-term strategy to implement smart export controls that incentivize allies and partners, such as South Korea and Taiwan, to work with the United States in effectively engaging in a new era of strategic trade?

Question 2. What specific legislative actions could Congress consider to strengthen the Department's ability to implement such a smart export control strategy?

Answer. The Commerce Department and its interagency partners continue to assess the security environment and are in regular communication with like-minded international partners and allies regarding issues of mutual security concern. On October 13, 2023, BIS issued a rule updating the general authorizations for Samsung and SK hynix—companies headquartered in the Republic of Korea (ROK)—for their semiconductor fabrication facilities in the Peoples Republic of China (PRC). Samsung's and SK hynix's PRC facilities are Validated End-Users

(VEUs), which means they can apply for, and after national security review and approval by the U.S. government, obtain a general authorization to acquire certain items rather than seeking multiple individual licenses.

The rule issued on October 13, 2023, allows these companies to continue their operations in the PRC. The VEU authorizations reflect close consultations between the United States and ROK through various channels, including the Korea-U.S. Supply Chain and Commercial Dialogue (SCCD) and the SCCD Working Group on Export Controls announced in November 2022.

The United States and ROK and our companies play a critical role in the global semiconductor supply chain and the October 13, 2023, announcement demonstrates the strength of our partnership and commitment to a secure and transparent supply chain, particularly for memory chips.

These updated authorizations build on the case-by-case review process established in the October 7, 2022, rule imposing restrictions on China's access to advanced semiconductors and semiconductor manufacturing equipment, and related items, and reflect our ongoing communication on matters of mutual security interest.

Coordination among allies is among the most critical elements to any successful export control regime, and we are constantly reviewing and refining our export controls in response to the evolving national security context. To that end, BIS is in constant communication with international allies and partners that share our democratic values, security, and other interests to help them understand our views on the current threat environment, explain our approach to export controls, and to enlist their assistance in aligning controls. Our national security interests, and the impact of our export control policies, are best served when we foster collaboration with our international partners.

Benefits to Illinois

The Recompete program holds the potential to help communities grappling with persistent economic challenges by providing critical resources that will enable them to become leaders in high-growth, high-wage sectors, such as advanced manufacturing.

In Illinois, we're witnessing a manufacturing resurgence in Central Illinois, but much work remains to ensure this growth brings shared prosperity that reduces racial inequality and lifts all communities.

Illinois is home to large numbers of skilled workers who are ready, willing, and able to adapt to work in emerging industries, but also struggling to address persistent inequality, especially regarding Black wealth and employment, make our State well-suited for the Recompete pilot program.

Question 1. Please discuss the real world economic benefits that will result from Congress fully funding the Recompete pilot program.

Question 2. Please describe the Economic Development Administration's composite of an ideal Recompete Pilot Program applicant.

Answer. As part of the Department's commitment to creating good-paying jobs and ensuring that no community is left behind, another key element of the CHIPS and Science Act is the Distressed Area Recompete Pilot Program (Recompete), housed in the Economic Development Administration (EDA). Recompete targets the hardest-hit and most economically distressed communities where prime-age (25–54 years) employment is significantly lower than the national average, with the goal to close this gap through flexible, locally-driven investments. The Recompete program aims to catalyze long-term economic opportunity through these investments that target the unique underlying conditions of a particular place. Through its bottom-up, community-driven approach, Recompete will provide employment opportunities in concentrated areas. Through a two-phase competition, Recompete will provide transformational investments of approximately $20-$50 million to 4-8 communities across the country.

The Department is grateful to Congress for the $200 million dollars that it received in FY23 to make transformational investments in distressed communities across the Nation and catalyze renewed competitiveness and economic opportunity for workers and families. However, this funding represents a fraction of the $1 billion the program was authorized through the CHIPS and Science Act, and it is dwarfed that much more by the demand for these kinds of crucial investments. At the closing of the Phase 1 application window in October 2023, the program received 565 applications, marking the largest number of applications of any national EDA competition to date. Applications represented all parts of the country—coming from 49 states and 4 territories—and identified more than $6.6 billion in investment needs to tackle persistent economic distress in their communities. In Phase 2, Recompete will make concentrated awards in just 4–8 regions, meaning that many ap-

plicants that submit quality, thorough applications will not receive the much-needed Recompete investments in their persistently distressed communities.

In December of last year, EDA announced 22 Recompete Finalists located across 20 states and Territories that represent a cross-section of urban and rural regions. Phase 2 investments will range from $20-$50 million and can be used to support a wide range of implementation activities across workforce development, business and entrepreneur development, infrastructure, and additional planning, predevelopment, or technical assistance. EDA also awarded 24 Strategy Development Grants (SDG) to help communities significantly increase local coordination and planning activities. Such development could make selected grantees more competitive for any future Recompete funding.

The 22 Recompete Finalists represent the top 10 percent of applicants from across the nation—they are working in places that on average, have prime-age (25–54 years) employment rates that trail the national average by more than 10 percentage points and an average median household income one-third below the national average. To combat long-term distress, each Finalist built a Recompete Plan that articulated a tailored investment thesis based on root causes, ranging from shifting global markets, to addiction, to economic isolation. These plans brought together strong public, private, and civic partnerships –together, Finalists submitted more than 530 letters of support, many of which represent specific and targeted partnerships and local commitments from local elected officials (116), the private sector (125), higher education and workforce training organizations (104), and community based and labor organizations (103).

The President's FY 2025 Budget requests an additional $41 million for the Recompete Pilot Program. This would allow EDA to make more grant awards to communities that have been for too long been forgotten through future rounds of the program in areas like workforce training, small business supports, infrastructure investments, and other critical investments to move the needle.

Critical Materials

Question 1. Please share the most troubling risks that the Department of Commerce has identified in the critical mineral supply chain.

Question 2. Please describe what steps the United States must take to better partner with allied countries to secure critical minerals, while lessening our Nation's dependence on sourcing critical minerals mined by firms our countries with strong ties to competitor and adversarial regimes, such as the PRC and the Russian Federation, since such sourcing often results in adverse humanitarian and national security costs.

Answer. To decrease our dependence on the People's Republic of China (PRC) for the critical minerals we need to drive our innovative economy, we need bold domestic investments and to work with allied countries. Without access to these materials, we risk falling behind the PRC in the race to invent and commercialize future generations of technology. Diverse, resilient, and sustainable supply chains are critical for national security and economic competitiveness, and a key element of this effort is revitalizing domestic manufacturing, reducing our reliance on the PRC, and positioning ourselves to be proactive instead of reactive.

Last year, the Commerce Department's International Trade Administration (ITA) established a Supply Chain Center. Housed in ITA's Industry and Analysis unit, the Center aims to be the analytic engine for supply chain resilience policy action within the U.S. Government. The Supply Chain Center integrates industry expertise and data analytics to develop innovative supply chain risk assessment tools and coordinate deep-dive analyses on select critical supply chains to drive targeted actions. The Center is proactive in getting ahead of supply chain challenges, strategic in setting priorities for policy focus and action based on data-driven risk analysis, a force multiplier in improving the targeting and effectiveness of U.S. Government investments, and a partner to industry in building resilient supply chains and supporting U.S. businesses to lead the industries of the future.

In addition, the Department is making a wide range of contributions to U.S. supply chain resiliency, which include, but are not necessarily limited to, the following: 1) Supply Chain Data Summit: The Department, led by the Supply Chain Center and the Industry and Analysis unit, will convene a diverse array of public and private stakeholders at a Supply Chain Data and Analytics Summit in 2024. The event will gather expert input to inform supply chain risk assessment models and tools and facilitate expanded sharing of data and analytic capabilities; 2) CHIPS Notice of Funding Opportunity: Commerce, along with CHIPS for America, has driven action on semiconductor supply chains. On September 29, Commerce released a second funding opportunity to strengthen the resilience of the semiconductor supply chain, advance U.S. technology leadership, and support vibrant domestic semiconductor

clusters. The funding opportunity seeks applications for commercial semiconductor materials and manufacturing equipment facilities with capital investments less than $300 million. It builds upon the Department's announcement in June 2023 expanding funding to larger supply chain projects. Supply chain applicants are vital to producing semiconductors in the United States, supporting the domestic manufacturing ecosystem, and creating jobs and opportunities in communities across the country; 3) Manufacturing Extension Partnerships (MEP): Small and medium-sized manufacturers are vital to U.S. supply chains, and Commerce has been expanding its work to support them. Administered by DOC's National Institute of Standards and Technology, the network of MEPs works to drive innovation and sustainability in manufacturing and build U.S. manufacturing capacity at all tiers in the supply chain ecosystem. In June 2023, MEP awarded more than $20 million across the MEP National network to create the Supply Chain Optimization and Innovation Network, or S–COIN, which will focus on providing supplier scouting services, establishing new service offerings to improve existing supply chain networks, filling gaps in the supply chain by connecting original equipment manufacturers with small and medium-sized manufacturers, and creating a complete map of U.S. supplier capability and capacity; 4) Indo-Pacific Economic Framework for Prosperity (IPEF): The United States, with Commerce playing a leading role, and 13 regional partner nations have substantially concluded negotiations on agreements under IPEF related to supply chains, climate and sustainability, preventing and combatting corruption, and improving tax transparency and tax administration. In particular, the IPEF Supply Chain Agreement is a first-of-its-kind, innovative accord that will help build resilience and competitiveness into critical supply chains, and Commerce is kickstarting this effort through pilot projects to enhance the resilience of key supply chains, including those related to semiconductors, critical minerals, and cold chain services; and 5) Census Data Collection: Through the Census Open Innovations Lab (COIL), the Census Bureau is currently in phase 2 of the *StatVentures Supply Chain Challenge,* which seeks innovative data ideas from the public, industry, and academia to improve measurement of supply chains. Census is also developing new data and visualization tools to expand U.S. Government insights into manufacturing, imports/exports, movement of goods, sale of goods, labor supply, and more.

We are also working with our allies and partners such as Canada and Australia. In October, the United States and Australia held the first meeting of the U.S.-Australia Critical Minerals Taskforce and convened a government-to-business Critical Minerals Industry Roundtable. Leveraging the growing economic connections between both countries, the Taskforce identified areas in which the U.S. and Australian governments can take joint action to increase investment in critical minerals mining and processing projects in our respective countries and enhance market transparency in this sector. The Taskforce also discussed how to support innovative research and development into efficient technologies and practices related to sustainable mining, enhanced mineral recovery from unconventional sources, and new processing methods. Through the Taskforce, we will deepen cooperation to deliver sustainable, resilient, and secure critical minerals and clean energy to the world and reduce global emissions, including by: (1) collaborating to map complementary production capacities across our respective critical minerals supply chain; (2) working towards mutual recognition of common and aligned Environmental, Social, and Governance (ESG) standards for the sector, including on labor and environmental protection; (3) increasing information sharing to help each country shape local priorities and support industry investment; and (4) enhancing collaboration on traceability practices for verifying provenance of critical minerals and commodities.

Developing options to improve market dynamics and address non-market practices for critical minerals is necessary to the growth of our respective economies and energy sectors including through considering actions to increase transparency on mineral market transactions. Earlier this year, the United States and Canada updated our Joint Action Plan on Critical Minerals Cooperation. Under the Plan, the Departments of State, Commerce, Defense, and Energy and the U.S. Geological Survey will work with Canadian counterparts on increased information and data sharing, joint efforts to promote private sector engagement, coordination on research and development, and cooperation at multilateral fora.

Additionally, Commerce is engaged in working groups on critical minerals with allies such as Brazil, the European Union, and Japan, and also participates in certain United Nations International Metals Study Groups.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. KYRSTEN SINEMA TO HON. GINA M. RAIMONDO

Environmental Reviews and Categorical Exclusions

I am grateful that you reiterated your support at the hearing for a bipartisan NDAA amendment I worked on with Senate colleagues that would streamline environment reviews under the CHIPS and Science Act.

Relatedly, the Commerce Department through the National Institute of Standards and Technology (NIST) announced in September the adoption of 11 Department of Energy (DOE) categorical exclusions under the National Environmental Policy Act (NEPA) to help expedite review for semiconductor manufacturing projects that receive funding through the CHIPS and Science Act.

Question 1. Can you guarantee that NIST's recently adopted DOE categorical exclusions will apply to all CHIPS grant applications?

Question 2. If not, can you please provide details on how the applicability of NEPA categorical exclusions will work?

Answer. The CHIPS Program Office (CPO) is taking every reasonable step to meet the Department's responsibilities under the National Environmental Policy Act (NEPA) in a timely manner.

The Department is doing everything within its power to stand up a fast process for issuing CHIPS incentives. As we build out American semiconductor manufacturing capabilities, we must also maintain basic environmental protections.

Regarding categorical exclusions (CEs), CPO will determine if a CE can be applied to a project after a review of each individual application. If a proposed action falls into an available CE—that is, a category of action that CPO has determined normally does not significantly affect the quality of the human environment—CPO will determine if extraordinary circumstances are present. If not, or if significant effects can be avoided despite the presence of extraordinary circumstances, CPO will apply the CE. A description of the 11 CEs that currently are available to all Department of Commerce (DOC) components can be found within the notice issued by DOC at 74 Fed. Reg. 33,204 (July 10, 2009). A description of the 11 DOE CEs that were recently adopted by NIST can be found within the notice issued by DOC at 88 Fed. Reg. 64,884 (September 20, 2023). As noted in the question, the Department is working to adopt relevant CEs from other agencies.

Finally, on December 27, 2023, CHIPS for America published a draft Programmatic Environmental Assessment (PEA) on the Federal Register ("Notice of Availability of Draft Programmatic Environmental Assessment for Modernization and Internal Expansion of Existing Semiconductor Fabrication Facilities Under the CHIPS Incentives Program"). The purpose of the PEA is to evaluate the environmental impacts of modernization and internal expansion projects that are eligible for the February 2023 CHIPS Incentives Program Commercial Fabrication Facilities Notice of Funding Opportunity (NOFO). The finalization of the PEA will allow CPO to complete a more streamlined NEPA review of these types of modernization projects. Comments must be received by January 25, 2024. The CHIPS Environment team is dedicated to creating an efficient and robust NEPA process. As detailed in the February 2023 NOFO, the CHIPS Program seeks to support current-generation and mature-node semiconductors facilities vital to our country's national and economic security. A streamlined environmental review will allow these upgrade and modernization projects to proceed expeditiously.

Environmental Protection Agency (EPA) Coordination

Building on permitting reform, it is also essential that the Commerce Department works in tandem with other Federal agencies to balance environmental concerns with effective implementation. For example, the Maricopa Association of Governments, whose municipalities cover a rapidly growing region of over five million people, has raised concerns with the Phoenix-Mesa area's attainment status under the ozone National Ambient Air Quality Standards. The potential impact of the more onerous Federal requirements or sanctions under current attainment status could be disastrous for continued semiconductor investment.

Question 1. Have you spoken with EPA Administrator Regan about EPA standards, and proposed revisions to standards, and their potential effect on semiconductor investment?

Answer. CPO spoke with EPA Administrator Regan in July, following the White House Environmental Justice Advisory Council's letter urging stronger action on ozone. That letter raised questions about whether the EPA would lower the national ozone standards below 70 parts per billion (ppb). Such an action would have impacted the attainment status of most major metropolitan areas in the United States.

Additionally, CPO has met with EPA staff in the New Source Review Group (NSRG) on several occasions. The discussion with NSRG included the application of General Conformity and the EPA's awareness of the semiconductor industry.

Question 2. How are you working to ensure that the administration effectively balances the economic and national security imperatives of the CHIPS and Science Act with other prerogatives?

Answer. CPO conducts a rigorous and methodical review of all aspects of potential recipients' applications that evaluates all the criteria identified in the statute as well as the evaluation criteria identified in the notices of funding opportunity announcements. CPO weighs these factors both on the merits of an individual company proposal as well as in the context of the broader portfolio of applications received by CPO. A balanced portfolio is a key objective of the grant program.

National Semiconductor Technology Center (NSTC) Facilities

In May 2023 NIST Director Locascio testified before the House Science Committee that NIST would not be involved in NSTC Technical Center site selection and will leave that up to the Board of Trustees.

Question 1. Given that, what do you expect the process to look like for selecting technical centers and how will the Commerce Department and NIST ensure that the most advanced industry facilities and regional semiconductor ecosystems are considered and included in the expected network of NSTC Technical Centers?

Question 2. Will the NSTC issue Requests for Proposals for each center, and what role will the CHIPS R&D Office have in that process?

Question 3. How many facilities do you expect will be selected, and to what degree will the NSTC support them via grant awards or other funding mechanisms?

Answer. As stated in the March NSTC Vision and Strategy Paper, the Department of Commerce intends for the NSTC to (1) support world-class research across the domestic ecosystem, (2) provide access to physical assets, and (3) include a headquarters facility and additional locations that leverage existing facilities.

CHIPS Research and Development has made significant progress towards the objectives of the NSTC over the past year. In October 2023, CHIPS announced the initial Board of Trustees for the independent, non-profit NSTC operator once the NSTC is formally established. In November, CHIPS announced both the incorporation of the non-profit operator and the first funding agreement between the Department and operator, which will enable operator activities such as hiring its executive leadership and developing a framework and sequence for further operations.

Future funding agreements to further define and fund the activities of the operator remain under development. The Department expects that the specific number, specifications, organization, and selection of facilities will be determined with consideration given to the research needs of the domestic scientific and industry community, an understanding of currently available infrastructure, and the desire to rapidly provide access to capabilities.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JACKY ROSEN TO HON. GINA M. RAIMONDO

Economic Development Programs

The *CHIPS and Science Act* enacted the Regional Technology and Innovation Hub Program or the Tech Hubs Program and the Recompete Pilot Program—both of which are critical for growing and strengthening our workforce, innovation, and regional economies. I know in Nevada, we have applications pending for these grant opportunities from across our state. Some states will lead the way in chip manufacturing, but states like mine will play an important role in other parts of the manufacturing process like advancing innovative research and training a skilled workforce. EDA grants like these will ensure all states can help bring advanced manufacturing home.

Question 1. As Nevada waits for the award announcements, what is the timeline for the first round of awards and how are you ensuring that economic development investments reach ALL states?

Question 2. What outreach have you been doing to make sure communities know about these funding opportunities including in tribal, rural, and underserved communities?

Answer. The Economic Development Administration's Regional Technology and Innovation Hubs (Tech Hubs) program is working to create regional innovation centers across the country by bringing together industry, higher education institutions, state and local governments, economic development organizations, and labor and

workforce partners to supercharge ecosystems of innovation for technologies that are essential to our national security and economic competitiveness. The Tech Hubs program is a key part of President Biden's Investing in America agenda, stimulating private sector investment, creating good-paying jobs, revitalizing American manufacturing, and ensuring no community is left behind by America's economic progress.

Through the Tech Hubs program, the Department is committed to strengthening economic and national security by advancing the capacities of regions to commercialize, manufacture, and deploy these technologies, guided by the following priorities: 1) making more U.S. regions strong competitors in the global innovation economy; 2) building strong communities that share in the prosperity technological innovations bring; 3) spurring the creation of new good jobs and other opportunities for workers at all skill levels; and 4) strengthening and increasing the resilience of the supply chains that our innovative, technology-centric industries rely on to stay secure and competitive.

The Tech Hubs Program is charged with increasing American competitiveness in technologies that contribute to national and economic security. The program is also designed to identify geographically diverse regions with the concentration of assets, talent, technology innovation ecosystems, and other resources that form a foundation on which a region can become globally competitive in its selected technology area. By leveraging regional resources, ranging from local talent pools to physical geography, Tech Hubs is investing in the people, places, and technologies that will power the future of the American economy.

On October 23, 2023, the President announced the winners of Phase 1 of the Tech Hubs program, and EDA posted the Notice of Funding Opportunity for Phase 2. This announcement included 31 designated Tech Hubs across 32 states and Puerto Rico, as well as the 29 consortia that will receive Strategy Development Grants. The 31 designated Tech Hubs focus on developing and growing innovative industries in regions across the country, including semiconductors, clean energy, critical minerals, biotechnology, precision medicine, autonomy, quantum computing, and more. The Department is grateful to Congress for the $500 million in appropriations that we received in FY 2023 to catalyze investment in technologies critical to economic growth, national security, and job creation, and help communities across the country become centers of innovation critical to American competitiveness.

This amount, however, represents only five percent of the $10 billion that was authorized through the CHIPS and Science Act. At this funding level, EDA is only able to invest approximately $40–70 million in each of approximately 5–10 Hubs, while the authorization envisions investments of hundreds of millions and up to $1 billion in 20 or more Hubs across the country. Based on the level of interest EDA saw in Phase 1—nearly 400 applications, including nearly 200 seeking to compete for these large investments—demand exceeds our currently available funds by 100x when considering both applications received and maximum possible investment levels.

While EDA implemented the program and selected the Phase 1 winners with geographic diversity as a core principle, including by meeting or exceeding statutory requirements for small and rural communities, low-population states, and Established Program to Stimulate Competitive Research (EPSCoR) states, not every deserving, high-potential applicant will be designated a Tech Hub or receive funding at current funding levels. The President's budget highlights the importance of the Tech Hubs program by requesting the next $4 billion of the authorized level, putting EDA on track to invest more funding in more Hubs through future rounds of the program so regions can create and implement innovation-based growth strategies and access the concentrated investments that will unlock solutions to grand challenges, equitably increase individual prosperity, and strengthen U.S. global competitiveness.

Recompete. As part of the Department's commitment to creating good-paying jobs and ensuring that no community is left behind, another key element of the CHIPS and Science Act is the Distressed Area Recompete Pilot Program (Recompete), housed in the Economic Development Administration (EDA). Recompete targets the hardest-hit and most economically distressed communities where prime-age (25–54 years) employment is significantly lower than the national average, with the goal to close this gap through flexible, locally-driven investments. The Recompete program aims to catalyze long-term economic opportunity through these investments that target the unique underlying conditions of a particular place. Through its bottom-up, community-driven approach, Recompete will provide employment opportunities in concentrated areas. Through a two-phase competition, Recompete will provide transformational investments of approximately $20–$50 million to 4-8 communities across the country. The final awards will be announced by late summer 2024.

The Department is grateful to Congress for the $200 million that it received in FY23 to make transformational investments in distressed communities across the

Nation and catalyze renewed competitiveness and economic opportunity for workers and families. However, this funding represents a fraction of the $1 billion the program was authorized through the CHIPS and Science Act, and it is dwarfed that much more by the demand for these kinds of crucial investments. At the closing of the Phase 1 application window in October 2023, the program received 565 applications, marking the largest number of applications of any national EDA competition to date. Applications represented all parts of the country—coming from 49 states and 4 territories—and identified more than $6.6 billion in investment needs to tackle persistent economic distress in their communities. In Phase 2, Recompete will make concentrated awards in just 4–8 regions, meaning that many applicants that submit quality, thorough applications will not receive the much-needed Recompete investments in their persistently distressed communities.

In December of last year, EDA announced 22 Recompete Finalists located across 20 states and Territories that represent a cross-section of urban and rural regions. Phase 2 investments will range from $20–$50 million and can be used to support a wide range of implementation activities across workforce development, business and entrepreneur development, infrastructure, and additional planning, predevelopment, or technical assistance. EDA also awarded 24 Strategy Development Grants (SDG) to help communities significantly increase local coordination and planning activities. Such development could make selected grantees more competitive for any future Recompete funding.

The FY 2025 President's Budget requests an additional $41 million for the Recompete Pilot Program. This would allow EDA to make more grant awards to communities that have been for too long been forgotten through future rounds of the program in areas like workforce training, small business supports, infrastructure investments, and other critical investments to move the needle.

Equity is EDA's top investment priority and embedded in the design of the Recompete Pilot Program, and the program intends to invest in economic activity in geographically diverse and persistently distressed communities across the country. Funding will be provided exclusively to distressed communities, and within these areas applicants were asked to demonstrate how benefits from the program would be shared equitably across all affected populations. Applicants were also asked to demonstrate how they engaged underserved communities in the upcoming application and planning process. EDA conducted multiple outreach sessions for communities across the country during the Phase 1 application period, including stakeholders from tribal and rural communities, as well as community-based organizations. Finally, in the early stages of program design the Phase I NOFO was informed by a request for information (RFI) issued February 23, 2023, and Tribal Consultation held on March 9, 2023, both of which shaped key features of the competition.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BEN RAY LUJÁN TO HON. GINA M. RAIMONDO

The formal CHIPS solicitation for the Commercial Facilities NOFO reads, "It is generally expected that most CHIPS Direct Funding awards will range between 5–15 percent of project capital expenditures." While this is certainly laudable for large semiconductor manufacturers who will have no problem securing equity or debt financing for projects, for many smaller applicants, this 15 percent investment by the CPO will not enable their business cases to close on critical projects. For smaller dual-use, defense-critical projects, they require large sums of capital to be committed early in projects, and investment tax credits could take several years to recoup.

Question 1. In order to maintain the diversity of projects intended in the CHIPS and Science Act, do you agree that the Department of Commerce should consider increasing the percentage of direct funding investment in smaller projects if they meet all other CHIPS requirements?

Answer. A diversity of project and technology types will be necessary to achieve the Department's program goal as laid out in the "Vision for Success: Commercial Fabrication Facilities." As stated in our Commercial Fabrication Facilities Notice of Funding Opportunity (NOFO), the Direct Funding amount will take into account a variety of criteria, including the project's financial model and expected cash flows, the project's estimated internal rate of return, the strategic importance of the project to U.S. economic and national security, and other criteria. Ultimately, the specifics of each project—and how a project advances the program's strategic goals—will determine award size amount.

Secretary Raimondo, thank you for your commitment to brief Congress on the recent Partnering to Advance Trusted and Holistic Spectrum Solutions (PATHSS) report submitted by the Department of Defense (DoD) to the Department of Commerce, as required by the Infrastructure Investment and Jobs Act. There's been much attention on the 3.1GHz—3.45 GHz electromagnetic spectrum band, particularly the sharing feasibility analysis your Department co-chaired with DoD.

Question 2. Will you commit—in addition to briefing Congress—that the Department of Commerce will make a public summary available?

Question 3. Commerce has the unique dual role of both to promote commerce in the United States, including support for non-Federal spectrum users, and to serve as the spectrum manager for Federal agencies. How does the Department intend to promote non-Federal uses of spectrum while ensuring that Federal systems are afforded the continued, reliable access to spectrum they need to perform critical national security missions?

Question 4. How does the Department intend to leverage the PATHSS report's findings in decisions regarding the 3.1 GHz–3.45 GHz spectrum band, and further, the PATHSS process into future spectrum allocation decisions?

Answer. The National Telecommunications and Information Administration (NTIA) has a dual imperative built into its statutory role. NTIA is both the manager of Federal spectrum resources, and the President's primary advisor on these issues. Given these dual roles, NTIA's obligation is to work with the agencies to ensure that we have the spectrum needed for our economic security and growth while protecting national security and critical Federal missions and capabilities. To meet this obligation, it is absolutely essential that bands be studied before decisions are made about repurposing.

On September 28, 2023, the Department of Defense submitted its Emerging Mid-Band Radar Spectrum Sharing (EMBRSS) Feasibility Assessment to the Department of Commerce. The Department appreciated the opportunity to have provided a briefing on November 16, 2023, to the Committee, in conjunction with the DoD, on the contents of the report after it was submitted by the DoD to the Department. In conjunction with this briefing, DoD provided a Controlled Unclassified Information (CUI) version of the report to interested Committee members and their staff. The Department and its DoD colleagues are committed to working with the Committee to ensure it can perform its oversight functions related to the report and next steps regarding the 3.1–3.45 GHz band.

On November 13, 2023, Biden-Harris Administration released a National Spectrum Strategy identifying more than 2,700 megahertz of airwaves to study for innovative new uses by both the private sector and Federal agencies. The Strategy identifies 2,786 megahertz of spectrum across five spectrum bands for in-depth study to determine suitability for potential new uses. That is nearly double NTIA's initial target of 1,500 megahertz. The spectrum target includes more than 1,600 megahertz of midband spectrum—a frequency range in high demand by the wireless industry for next-generation services. The Biden-Harris Administration published an Implementation Plan on March 12, 2024, to carry out the Strategy, which is envisioned as a living document, intended to be assessed and updated in the future as spectrum requirements and opportunities evolve. The Implementation Plan sets out the requirements for a follow-on study to the EMBRSS report. President Biden also released the Presidential Memorandum on Modernizing United States Spectrum Policy and Establishing a National Spectrum Strategy, which will promote a trustworthy, predictable and evidenced-based process for ensuring spectrum serves its highest and best use.

The CHIPS and Science Act is going to bring critical advanced manufacturing and jobs to the United States. Advanced manufacturers have a demonstrated need for private wireless networks to improve savings and efficiency. In some cases, under these systems, each individual widget within a factory is tracked and monitored. Private networks also have unique benefits for reliability and security, and security is essential for advanced manufacturers in critical sectors supported by the CHIPS and Science Act. Currently, advanced manufacturers already utilize the Citizens Broadband Radio Service (CBRS) spectrum band for this type of private network. According to reports, TSMC is planning to deploy this type of network at the announced semiconductor fabrication plant in Arizona.

Question 5. Can you discuss how private wireless technologies currently deployed in the CBRS band can help support new advanced manufacturing in the United States and why security and reliability are so critical for those networks?

Answer. Citizens Broadband Radio Service (CBRS) allows for dynamic spectrum sharing between the Department of Defense (DoD) and commercial spectrum users. The DoD users have protected, prioritized use of the spectrum. When the govern-

ment is not using the airwaves, companies and the public can gain access through a tiered access arrangement. This means the DoD can use the same spectrum for its critical missions while companies can use it for 5G and high-speed Internet deployment. According to a May 2023 report from NTIA's Institute for Telecommunication Sciences (ITS), CBRS is working. Researchers reviewed aggregated data on CBRS devices–such as cell towers– between April 1, 2021 and January 1, 2023. They found the number of devices nationwide grew by 121 percent over the 21-month analysis period–an indication that access to the spectrum is growing. There are several commercial use cases, like for private networks used in modern manufacturing and that could also be used by industrial IoT, 5G wireless and utilities. The BCRS offers different tiers of spectrum access, allowing non-federal users varying degrees of spectrum reliability and also the flexibility to implement their own security within the networks.

The CHIPS and Science Act makes a historic commitment to research and development in the United States. The benefits of this advanced technology will only extend as far as families in America have access to those technologies, particularly access to resilient and secure high-speed broadband. The Affordable Connectivity Program (ACP) is the only permanently authorized pubic benefit program established in the last Congress. The Administration has rightly celebrated increasing participation in the Program, which along with commitments by many Internet Service Providers has made broadband effectively free for many Americans. Now, eligible households do not have to choose between putting food on the table, paying rent, and ensuring access to school, work, and loved ones. Unfortunately, the President did not request any additional funding for ACP in his budget even though BEAD grantees plans are explicitly required to participate on ACP to help connect low-income citizens.

Question 6. How does the Department of Commerce expect BEAD grantees to meet the ACP participation requirements if the ACP runs out of funding, as expected in March 2024?

Answer. The Biden-Harris Administration is committed to connecting everyone across America to affordable, reliable, high-speed Internet service, and the Affordable Connectivity Program (ACP) is at the heart of the Biden-Harris Administration's efforts to make the goal of Internet for All a reality. ACP is critical for the success of NTIA's broadband infrastructure programs because users need to be able to afford to get online and providers need the certainty that they will have customers, especially in rural and low-income communities, before they deploy their networks.

Pursuant to Infrastructure Investment and Job Act (IIJA), NTIA's BEAD program requires that participating Internet Service Providers offer a low-cost option. ACP helps ensure that providers can deliver on this requirement in all corners of the country, and ultimately meet the broader goal of connecting everyone in America to affordable, reliable, high-speed Internet service. It is imperative that ACP is put on firm financial footing going forward, and the Biden-Harris Administration has *called on Congress* to provide $6 billion to extend this program.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. RAPHAEL WARNOCK TO HON. GINA M. RAIMONDO

Regional Technology Hubs and Geographic Diversity

The CHIPS and Science Act (P.L. 117–167) authorizes regional technology hub programs within various agencies, including at the Economic Development Administration (EDA) and National Science Foundation (NSF). This legislation also requires geographic diversity within each program.[1]

Question 1. How does geographic diversity in these programs contribute to our national security and our ability to compete on the global stage?

Question 2. How will you coordinate across agencies to ensure geographic diversity across all programs created under the CHIPS and Science Act?

Answer. The Economic Development Administration's Regional Technology and Innovation Hubs (Tech Hubs) program is working to create regional innovation centers across the country by bringing together industry, higher education institutions, state and local governments, economic development organizations, and labor and workforce partners to supercharge ecosystems of innovation for technologies that are essential to our national security and economic competitiveness. The Tech Hubs pro-

[1] *See, e.g., https://www.eda.gov/funding/programs/regional-technology-and-innovation-hubs/faq; https://www.nsf.gov/pubs/2022/nsf22082/nsf22082.jsp.*

gram is a key part of President Biden's Investing in America agenda, stimulating private sector investment, creating good-paying jobs, revitalizing American manufacturing, and ensuring no community is left behind by America's economic progress.

Through the Tech Hubs program, the Department is committed to strengthening economic and national security by advancing the capacities of regions to commercialize, manufacture, and deploy these technologies, guided by the following priorities: 1) making more U.S. regions strong competitors in the global innovation economy; 2) building strong communities that share in the prosperity technological innovations bring; 3) spurring the creation of new good jobs and other opportunities for workers at all skill levels; and 4) strengthening and increasing the resilience of the supply chains that our innovative, technology-centric industries rely on to stay secure and competitive.

The Tech Hubs Program is charged with increasing American competitiveness in technologies that contribute to national and economic security. The program is also designed to identify geographically diverse regions with the concentration of assets, talent, technology innovation ecosystems, and other resources that form a foundation on which a region can become globally competitive in its selected technology area. By leveraging regional resources, ranging from local talent pools to physical geography, Tech Hubs is investing in the people, places, and technologies that will power the future of the American economy.

On October 23, 2023, the President announced the winners of Phase 1 of the Tech Hubs program, and EDA posted the Notice of Funding Opportunity for Phase 2. This announcement included 31 designated Tech Hubs across 32 states and Puerto Rico, as well as the 29 consortia that will receive Strategy Development Grants. The 31 designated Tech Hubs focus on developing and growing innovative industries in regions across the country, including semiconductors, clean energy, critical minerals, biotechnology, precision medicine, autonomy, quantum computing, and more. The Department is grateful to Congress for the $500 million in appropriations that we received in FY 2023 to catalyze investment in technologies critical to economic growth, national security, and job creation, and help communities across the country become centers of innovation critical to American competitiveness.

This amount, however, represents only five percent of the $10 billion that was authorized through the CHIPS and Science Act. At this funding level, EDA is only able to invest approximately $40–70 million in each of approximately 5–10 Hubs, while the authorization envisions investments of hundreds of millions and up to $1 billion in 20 or more Hubs across the country. Based on the level of interest EDA saw in Phase 1—nearly 400 applications, including nearly 200 seeking to compete for these large investments—demand exceeds our currently available funds by 100x when considering both applications received and maximum possible investment levels.

While EDA implemented the program and selected the Phase 1 winners with geographic diversity as a core principle, including by meeting or exceeding statutory requirements for small and rural communities, low-population states, and EPSCoR states, not every deserving, high-potential applicant will be designated a Tech Hub or receive funding at current funding levels. The President's budget highlights the importance of the Tech Hubs program by requesting the next $4 billion of the authorized level, putting EDA on track to invest more funding in more Hubs through future rounds of the program so regions can create and implement innovation-based growth strategies and access the concentrated investments that will unlock solutions to grand challenges, equitably increase individual prosperity, and strengthen U.S. global competitiveness.

The Department of Commerce is committed to working with relevant Federal agencies to implement programs authorized under the CHIPS and Science Act that in a way that is merit-based and represents the full diversity of America. The Tech Hubs Program takes a whole-of-government approach to supporting the tech economy and national security that includes identifying and providing support, guidance, and additional funding opportunities across the Department of Commerce and from other Federal agencies. EDA is also working with other Federal agencies to identify how their programs and place-based investments complement the Tech Hubs Program.

EDA has established a Memorandum of Understanding with National Science Foundation and has coordinated with multiple Commerce bureaus and other Federal departments and agencies in its implementation of the Tech Hubs program and in supporting Hubs achieve growth.

Rulemaking

A skilled domestic workforce is critical to the success of investments in the CHIPS and Science Act (P.L. 117–167), including those in semiconductor development, in-

formation technologies, manufacturing, and biotechnology. Community and technical colleges are well positioned to respond to the relevant emerging technologies workforce needs by providing shorter-term, experiential or work-based learning for a broad population of students, including rural Americans and those from underrepresented backgrounds.

Question 1. What roles do community and technical colleges play in addressing workplace shortages?

Question 2. What can Congress do to help Community and Technical colleges strengthen their capacity to train workers in the skills required to succeed in high-growth, high-demand industries?

Answer. In the one year since the CHIPS and Science Act was signed into law, companies have announced over $166 billion in manufacturing in semiconductors and electronics, and at least 50 community colleges in 19 states have announced new or expanded programming to help American workers access good-paying jobs in the semiconductor industry. As part of the Biden Administration's long-term vision for CHIPS for America, Secretary Raimondo has called on the United States to double the semiconductor workforce overall, for U.S. colleges and universities to triple the number of graduates in semiconductor-related fields, and for semiconductor companies to work with high schools, community colleges, and unions to train 100,000 new technicians. CHIPS for America will embrace a whole-of-society approach across government, education, labor unions, industry, and community organizations to achieve these ambitious goals.

The Department of Commerce is committed to helping more American workers compete and win in the 21st century global economy. The National Institute of Standards and Technology (NIST) Manufacturing Extension Partnership (MEP) helps businesses narrow gaps in our supply chains and make manufacturing more resilient.

NIST has issued a Notice of Funding Opportunity for Manufacturing USA Workforce, Education and Vibrant Ecosystems (WEAVE) public service awards to the 17 Manufacturing USA institutes. NIST is currently reviewing applications and anticipates awards will be announced early this year.

In Spring 2024, NIST intends to announce a funding opportunity for a new Commerce Department-sponsored Manufacturing USA institute. As with all Manufacturing USA institutes, there will be a program to educate and train skilled workers, working with community and technical colleges.

Additionally, in January 2024, the Department of Commerce issued a Notice of Intent to announce a competition for a new Manufacturing USA Institute. CHIPS for America is investing at least $200 million in a CHIPS Manufacturing USA Institute to create the first-of-its-kind institute focused on digital twins to lead the world in revolutionizing semiconductor and advanced packaging manufacturing. The CHIPS Manufacturing USA Institute will foster a collaborative environment to significantly expand innovation, bring tangible benefits to both large and small-to-medium-sized manufacturers, strengthen diverse research institutions, and ensure a national reach in workforce development. The new institute will have both regionally focused programs and meaningful cross-region participation. This nationwide model will best meet the CHIPS R&D program goals of strengthening U.S. technology leadership, accelerating ideas to market, and realizing a robust semiconductor workforce.

The Economic Development Administration (EDA)'s Regional Technology and Innovation Hubs (Tech Hubs) Program is working to create regional innovation centers across the country by bringing together industry, higher education institutions, state and local governments, economic development organizations, and labor and workforce partners to supercharge ecosystems of innovation for technologies that are essential to our national security and economic competitiveness. The Tech Hubs Program is a key part of President Biden's Investing in America agenda, stimulating private sector investment, creating good-paying jobs, revitalizing American manufacturing, and ensuring no community is left behind by America's economic progress.

Through the Tech Hubs Program, the Department is committed to strengthening economic and national security by advancing the capacities of regions to commercialize, manufacture, and deploy these technologies, guided by the following priorities: 1) making more U.S. regions strong competitors in the global innovation economy; 2) building strong communities that share in the prosperity technological innovations bring; 3) spurring the creation of new good jobs and other opportunities for workers at all skill levels; and 4) strengthening and increasing the resilience of the supply chains that our innovative, technology-centric industries rely on to stay secure and competitive.

The Tech Hubs Program is charged with increasing American competitiveness in technologies that contribute to national and economic security. The program is also designed to identify geographically diverse regions with the concentration of assets, talent, technology innovation ecosystems, and other resources that form a foundation on which a region can become globally competitive in its selected technology area. By leveraging regional resources, ranging from local talent pools to physical geography, Tech Hubs is investing in the people, places, and technologies that will power the future of the American economy.

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This amount, however, represents only five percent of the $10 billion that was authorized through the CHIPS and Science Act. At this funding level, EDA is only able to invest approximately $40–70 million in each of approximately 5–10 Hubs, while the authorization envisions investments of hundreds of millions and up to $1 billion in 20 or more Hubs across the country. Based on the level of interest EDA saw in Phase 1—nearly 400 applications, including nearly 200 seeking to compete for these large investments—demand exceeds our currently available funds by 100x when considering both applications received and maximum possible investment levels.

The President's budget highlights the importance of the Tech Hubs Program by requesting the next $4 billion of the authorized level, putting EDA on track to invest more funding in more Hubs through future rounds of the program so regions can create and implement innovation-based growth strategies and access the concentrated investments that will unlock solutions to grand challenges, equitably increase individual prosperity, and strengthen U.S. global competitiveness. Tech Hubs funding will be deployed across four categories of activities, including both workforce development projects and related infrastructure. Community and technical colleges are members of Tech Hubs consortia, and EDA expects that they will play a role in the workforce development projects of many Hubs. EDA plans to announce all Phase 2 awards in summer 2024.

Spectrum Interagency Coordination

The National Telecommunications and Information Administration (NTIA) is responsible for managing federally allocated spectrum and promoting its most efficient use.[2] This year, the Federal Communications Commission (FCC)'s authority to auction spectrum lapsed.[3]

Question 1. How should Federal agencies collaborate to maximize the efficient use of spectrum?

Answer. In August 2022, the National Telecommunications and Information Administration (NTIA) and the Federal Communications Commission (FCC) announced an updated Memorandum of Understanding (MOU) between our agencies on spectrum coordination. This was the first update to the MOU in nearly 20 years, and it is already paying dividends as the two agencies navigate complex issues together.

A wide array of Federal agencies use spectrum effectively to perform critical missions in service to all Americans—from national defense, to weather forecasting, to scientific observation, and more. The NTIA has a dual imperative built into its statutory role. NTIA is both the manager of Federal spectrum resources and the President's primary advisor on spectrum-related issues. In its statutory Federal spectrum management role, NTIA helps ensure the efficient use of spectrum by tailoring frequency assignments to demonstrated agency spectrum requirements. Significantly, most spectrum bands with Federal operations are shared, accommodating access by multiple—often many—agencies.

Spectrum used for Federal missions is also often shared with the private sector uses, and NTIA recognizes the need to make additional spectrum available for increased requirements. Given NTIA's dual roles, NTIA is focused both on ensuring

[2] *https://www.ntia.gov/category/spectrum-management*

[3] *https://www.fcc.gov/document/chairwoman-rosenworcel-expiration-spectrum-auction-authority*

that Federal agencies have the spectrum necessary to carry out their missions and ensuring that there is sufficient spectrum for private sector use to maintain U.S. global leadership in wireless technology and services. NTIA partners with Federal agencies to determine the most efficient use of spectrum, while also ensuring agencies have sufficient access to spectrum to support mission requirements. The National Spectrum Strategy, released in November 2023 and discussed in the response below, emphasizes a number of efforts related to agency collaboration and maximizing the efficient use of spectrum.

Question 2. What can Congress do to facilitate better agency coordination around spectrum?

Answer. On November 13, 2023, the Biden-Harris Administration released the National Spectrum Strategy, which 1) identifies over 2,700 MHz of spectrum across five spectrum bands for in-depth study for potential new uses by both the private sector and Federal agencies, 2) improves the spectrum decision-making process both within the government and between the private sector and the public sector, 3) calls for research and development of new spectrum management technology, and 4) calls for development of a National Spectrum Workforce Plan. The Presidential Memorandum on Modernizing United States Spectrum Policy and Establishing a National Spectrum Strategy, also released on November 13, 2023, establishes a clear and consistent spectrum policy and a process for resolving spectrum-related conflicts effectively. Congressional support for the Administration's modernized spectrum policy and efforts included in the National Spectrum Strategy will help facilitate better agency coordination around spectrum.

Solar Imports and Domestic Manufacturing

Last year, Congress passed the Inflation Reduction Act, which makes substantial investments in solar energy and manufacturing. In August 2023, the Department of Commerce determined that solar panel manufacturers in four Southeast Asian countries attempted to evade U.S. trade rules by using Chinese-sourced materials subject to tariffs without paying applicable duties.[4] These countries account for nearly three-quarters of the solar modules imported to the United States.[5] It is critical to support domestic solar manufacturing capacity while keeping our trading partners accountable.

Question 1. What can the Commerce Department do to support U.S. solar manufacturers while maintaining the supply of solar panels needed to satisfy current project demands?

Answer. The Department believes it is critical to build up the domestic manufacturing base required to deploy clean energy across the United States. The Biden-Harris Administration has prioritized investments that will create good-paying jobs and build secure solar supply chains in the U.S., including through tax credits in the Inflation Reduction Act (IRA) such as increased tax benefits for taxpayers who meet the prevailing wage and apprenticeship requirements. Thanks to the President's Investing in America agenda, more than 90 Gigawatts (GW) of private-sector investments in U.S. solar manufacturing have been announced since the President took office, with about half of that coming in just the seven months since the passage of the IRA. America is now on track to increase domestic solar panel manufacturing capacity eight-fold by the end of the President's first term.

Additionally, through SelectUSA, the U.S. government program housed within the Commerce Department which focuses on facilitating and promoting foreign investment into the United States, solar energy has been a key focus. Since the passage of the IRA, SelectUSA has facilitated clean tech investments into the United States worth over $10.2 billion.

In May 2023, SelectUSA assisted Enel North America to choose Inola, Oklahoma as the location to build its new industrial-scale manufacturing facility for innovative, sustainable and American-made photovoltaic (PV) cells and modules. The factory, which is expected to have an annual production capacity of 3 GW, represents an initial investment in excess of $1 billion and is anticipated to create 1,000 new direct permanent jobs by 2025. The project includes the potential for a second phase that would scale the factory to reach 6 GW of annual production, creating an additional 900 new direct jobs. SelectUSA also assisted Philadelphia Solar, a Jordanian based solar panel company that announced investment plans in November 2022 after passage of the IRA. Initial investment plans include $100 million to install a

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[4] *https://www.commerce.gov/news/press-releases/2023/08/department-commerce-issues-final-determination-circumvention-inquiries*

[5] *https://www.wusf.org/2023-08-18/the-u-s-imports-most-of-its-solar-panels-a-new-ruling-may-make-that-more-expensive*

1.2GW manufacturing line for U.S.-made mono-Passivated Emitter and Rear Cell (PERC) modules by 2024, with plans to invest in state-of-the-art cells production line by 2025 to support over 400 anticipated jobs. And in October 2022, Japanese automotive manufacturer Honda and South Korean Electric Vehicle (EV) battery manufacturer LG Energy Solutions announced a $4.2 billion investment to open a new EV battery plant and expand existing plants in Ohio, which is expected to create 2,527 jobs.

The United States is also committed to building a coalition of allies and partners to invest in the creation of strong, independent, and reliable clean energy supply chains that puts the free world in charge of its own clean energy future. For example:

- Through the Clean Economy pillar (Pillar 3) of the Indo-Pacific Economic Framework for Prosperity (IPEF), we are negotiating high-standard provisions with 13 other partners that will help grow U.S. exports for clean energy tech and help ensure that partners in the region work together, rather than turn to the PRC for their financing and technologies.
- On May 20, 2023, the Quad (consisting of the U.S., Australia, India, and Japan) announced that it will work together to identify and address gaps in our manufacturing capacity for critical clean energy materials and technologies. In particular, the program will focus on the supply chains for solar PVs, hydrogen electrolyzer, and EV battery technologies. Quad partners are contributing funding, technical expertise, and in-kind support to the supply chain assessment efforts and subsequent investment decisions. The Quad also established joint principles for clean energy supply chains.
- Also on May 20, 2023, the United States and Australia signed a statement of intent to advance our climate cooperation through the Australia-United States Climate, Critical Minerals, and Clean Energy Transformation Compact, including coordination to spur the diversification and expansion of clean energy supply chains.
- At the Clean Energy Ministerial, the United States co-leads a new initiative to foster the adoption of policies that transform the global solar supply chain to be more diverse, transparent, and environmentally and socially responsible.

As you noted, Commerce is also entrusted with the responsibility to investigate allegations of unfair trade to protect American businesses and workers from such harmful practices. On August 18, 2023, the Commerce Department announced the final determinations in the circumvention inquiries of solar cells and modules from the People's Republic of China (PRC). Commerce found that certain Chinese producers are shipping their solar products through Cambodia, Malaysia, Thailand, and/or Vietnam for minor processing in an attempt to avoid paying antidumping and countervailing duties (AD/CVD). The final determination affirms the preliminary findings in most respects and underscores the importance of rigorously enforcing trade law. Specifically, Commerce found that five companies were attempting to avoid the payment of U.S. duties by completing minor processing in third countries, and that three companies were not circumventing. Commerce also found that certain unexamined companies were circumventing.

Pursuant to the Presidential Proclamation issued on June 6, 2022, and Commerce's Final Rule "Procedures Covering Suspension of Liquidation, Duties and Estimated Duties in Accord With Presidential Proclamation 10414", duties will not be collected on any solar module and cell imports from these four countries until June 2024, as long as the imports are consumed in the U.S. market within six months of the termination of the President's Proclamation. Importantly, importers must certify that these modules and cells are installed within that time frame, lest they risk possible enforcement action by Customs and Border Protection. This provides U.S. solar importers with sufficient time to adjust supply chains and ensure that sourcing is not occurring from companies found to be violating U.S. law. Solar cells made in one of the four Southeast Asian countries, even if made from wafers from China, that are then exported to a non-inquiry country and further assembled into modules or other products there, before exportation to the United States, are not subject to Commerce's final circumvention findings.

Under U.S. law, Commerce may conduct a circumvention inquiry when evidence suggests that merchandise subject to an existing AD/CVD order is completed or assembled in third countries from parts and components imported from the country subject to the order. AD/CVD orders are designed to provide relief to the U.S. domestic industries when they are facing unfair competition. The Department's final determinations underscore Commerce's commitment to holding China accountable

for its trade distorting actions, which undermine American industries, workers, and businesses.

Long Term Effects of Semiconductor Investments

The CHIPS and Science Act (P.L. 117–167) is making substantial investments in American manufacturing and research and development.

Question 1. When do you expect funding awards to be finalized?

Question 2. How will a project's economic and social impact (such as workforce development and diverse supplier commitments) affect the award amount?

Question 3. How is the Commerce Department factoring the effects of climate change into how semiconductor manufacturing funding is allocated, given announced projects in the Southwest?

Question 4. In making funding decisions, how will the Commerce Department consider the extent to which a company prioritizes investments refresh technology and re-invest in facilities?

Question 5. The United States currently produces less than five percent of the world's memory chips, with many of the remaining chips coming from countries in Asia.[6] How is the CHIPS Program Office planning to ensure that there is domestic production of memory chips so that the United States does not have to rely solely on overseas production for memory chips?

Answer. The Department seeks to move as fast as possible with all funding opportunities to ensure that CHIPS funding can meet the pressing economic and national security needs. The Commerce Department's CHIPS for America program will evaluate each project holistically using the criteria articulated in our Notice of Funding Opportunities for CHIPS funds under the section 9902 Incentives Program, focused on commercial manufacturing facilities. Above all, the Department is seeking projects that advance economic and national security.

On January 4, 2024, the Department announced that it has reached a non-binding preliminary memorandum of terms (PMT) with Microchip Technology Inc. to provide approximately $162 million in Federal CHIPS incentives to support the onshoring of the company's semiconductor supply chain. This investment would enable Microchip to significantly increase its U.S. production of microcontroller units (MCUs) and other specialty semiconductors built on mature-nodes critical to America's automotive, commercial, industrial, defense, and aerospace industries and create over 700 direct construction and manufacturing jobs.

This announcement is the second PMT announcement by the Department under the CHIPS and Science Act. The first was announced in December 2023—a PMT with BAE Systems Electronic Systems, a business unit of BAE Systems, Inc., that will provide approximately $35 million in Federal incentives under the CHIPS and Science Act to modernize the company's Microelectronics Center in Nashua, New Hampshire, which is designated as a Trusted Foundry by the Department of Defense. Recently, the Department announced that it has signed a PMT with GlobalFoundries (GF) to provide approximately $1.5 billion to strengthen U.S. competitiveness in current-generation and mature-node semiconductor production, and support economic and national security capabilities. The proposed funding would support a new state-of-the-art facility, significant capacity expansion, and the modernization of GF's U.S. manufacturing sites in New York and Vermont, which produce essential automotive, communications, and defense semiconductor technologies. The Department also announced having reached a PMT with Intel Corporation to provide up to $8.5 billion to support strengthening all major technical processes for leading-edge chips in the United States, including proposed investments in Arizona, New Mexico, Ohio, and Oregon. Additional projects are anticipated to be announced in the coming months.

In the application review process, CHIPS Program Office (CPO) examines the risk of climate change, and a project's climate resiliency in two places: (1) under the Technical Feasibility section of the application, companies are asked to provide information on resource use to include water sources, project water consumption, as well as its air emissions and water effluent; and (2) in the Broader Impacts section of the application, the companies are asked to provide information regarding their climate resiliency plans. These responses are factored into the merit review scoring for these sections.

As part of the due diligence process, CPO expands on the answers provided in the application to better answer the question "How is the facility designed or how will the facility operate to address weather-and climate-related risks that may occur over

[6] *https://www.nytimes.com/2023/01/01/technology/us-chip-making-china-invest.html*

the lifetime of the facility." During the due diligence process, CPO requests and examines any climate resiliency plans or climate risk mitigation strategies provided by the company.

In addition to reviewing specific applications, CPO has also worked to identify potential cumulative impacts to resources vulnerable to climate change to ensure the overall success of semiconductor projects and managing their effect on the environment. As such, CPO has undertaken additional analysis of resource allocations in areas most vulnerable to climate change by engaging with state and local regulators and officials to better understand the impacts of the semiconductor projects to natural resources.

On December 27, 2023, CHIPS for America program published a draft Programmatic Environmental Assessment (PEA) on the Federal Register ("Notice of Availability of Draft Programmatic Environmental Assessment for Modernization and Internal Expansion of Existing Semiconductor Fabrication Facilities Under the CHIPS Incentives Program"). The purpose of the PEA is to evaluate the environmental impacts of modernization and internal expansion projects that are eligible for the February 2023 CHIPS Incentives Program Commercial Fabrication Facilities Notice of Funding Opportunity (NOFO). The finalization of the PEA will allow CPO to complete a more streamlined NEPA review of these types of modernization projects. Comments must be received by January 25, 2024. The CHIPS Environment team is dedicated to creating an efficient and robust NEPA process. As detailed in the February 2023 NOFO, the CHIPS Program seeks to support current-generation and mature-node semiconductors facilities vital to our country's national and economic security. A streamlined environmental review will allow these upgrade and modernization projects to proceed expeditiously.

As stated in our NOFO, Direct Funding amount will take into account a variety of criteria, including the project's financial model and expected cash flows, the project's estimated internal rate of return (IRR), the strategic importance of the project to U.S. economic and national security, the extent of private investment, the risks associated with the project, and other criteria.

The Department expects applicants to design their projects so that they avoid, minimize, and mitigate the potential for significant effects on the environment, and we are assisting applicants with the process for adhering to applicable environmental regulations.

As outlined in the NOFO, one of the program's six Evaluation Criteria is "Broader Impacts" that includes a company's commitment to building domestic R&D facilities (and in participating in other major R&D efforts in the United States) to ensure process technology innovation is occurring in the United States and a sustainable ecosystem is being built, as well as the strength of the applicant's commitment to support CHIPS R&D programs such as the National Semiconductor Technology Center (NSTC) and National Advanced Packaging Manufacturing Program (NAPMP).

As outlined in the Commerce Department's "Vision for Success: Commercial Fabrication Facilities" paper, the Department's four strategic objectives include:

- First, for leading edge logic, our goal is to both design and produce the most advanced chips here, in the United States, by the end of the decade. Right now, we manufacture zero of the world's most advanced chips on our shores. Specifically, by the end of the decade, the U.S. will have at least two new large-scale clusters of leading-edge logic fabs, with each cluster including multiple commercial-scale fabs, a large and skilled workforce, nearby suppliers, R&D facilities, and specialized infrastructure.
- Second, the U.S. will be home to multiple high-volume advanced packaging facilities. Packaging—the process of putting fabricated chips into containers that will ultimately be embedded in products—is an essential part of the manufacturing process, and one that will be core to new innovations in functionality and efficiency.
- Third, U.S.-based fabs will produce high-volume DRAM memory chips on economically competitive terms.
- And fourth, the U.S. will have increased its production capacity for the current-generation and mature chips that are vital to U.S. economic and national security.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. PETER WELCH TO HON. GINA M. RAIMONDO

Secretary Raimondo, as you may know, Vermont is a leader in the development of Radio Frequency (RF) technologies and is leading the way in the production of Gallium Nitrate (GaN) printed on Silicon chips, a new technology that provides greater power capacity for older chips. In fact, Vermont's largest employer is a semiconductor company called GlobalFoundries. GaN chips fabricated from legacy nodes play a critical role in our transition to 5G technologies and beyond, particularly for cars and smart appliances, which would burn out smaller chips or silicon-only chips. Unlike in the past, the production of smaller chips is no longer the only route to cutting-edge technology. The CHIPS and Science Act included $2 billion in incentives to produce mature, legacy node semiconductors. However, the United States is not the only country that is investing in onshoring semiconductor manufacturing. Many foreign companies and countries also dominate this space.

Question 1. How is the Department incentivizing demand for fabless companies to use U.S.-made chips?

Question 2. What is the Department doing to ensure that foreign competitors are not undercutting U.S. semiconductor companies?

Answer. U.S. fabless companies are well-positioned to benefit from the growth in U.S. semiconductor manufacturing. The Commerce Department's CHIPS Program Office (CPO) is in a regular dialogue with customers, whose message is clear: they want supply chain resilience. Diversifying risk means buying chips made in the United States, and companies understand that this is in their best interest.

Advancing U.S. national security is the primary objective of the CHIPS program. It is imperative that our investments and innovation benefit the American people, not our adversaries. In September 2023, the Commerce Department's CHIPS for America program released the final rule implementing the national security guardrails of the bipartisan CHIPS and Science Act. The rule elaborates on two core provisions of the statute: the first, prohibiting CHIPS funds recipients from expanding material semiconductor manufacturing capacity in foreign countries of concern for ten years; and the second, restricting recipients from certain joint research or technology licensing efforts with foreign entities of concern.

In December 2023, the Department announced that it reached a non-binding preliminary memorandum of terms (PMT) with BAE Systems Electronic Systems, a business unit of BAE Systems, Inc., that will provide approximately $35 million in Federal incentives under the CHIPS and Science Act to modernize the company's Microelectronics Center in Nashua, New Hampshire, which is designated as a Trusted Foundry by the Department of Defense.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. TED CRUZ TO HON. GINA M. RAIMONDO

CHIPS Application Requirements

The Notice of Funding Opportunity (NOFO) issued by your Department in March 2023 provided guidance for CHIPS Act commercial fabrication facility applicants that went far beyond the text of the statutory law, such as requiring a plan for access to child care for facility and construction workers; discriminating against non-union labor by strongly encouraging the use of project labor agreements (PLAs); and signaling strong support for providing paid leave, housing assistance, and transportation assistance to employees.

Question 1. Of the 100+ firms that have applied for CHIPS funding, how many already provide on-or near-site childcare to their employees that, in the view of your agency, meets the recommendations articulated in the March NOFO? Please list the firms.

Answer. The Department is currently evaluating applications and treats information submitted by applicants as confidential. To avoid any inadvertent disclosures and premature decisions, the Department is currently not disclosing how many applicants already provide on or near-site childcare to their employees or meet the recommendations articulated in the March NOFO. More information about CHIPS for America's commitment to protecting Confidential Business Information (CBI) can be found here: *https://www.nist.gov/chips/handling-confidential-information.*

Question 2. How many firms applying for CHIPS funding already provide transportation assistance that, in the view of your agency, meets the recommendations articulated in the NOFO? Please list the firms.

Answer. The Department is currently evaluating applications and treats information submitted by applicants as confidential. To avoid any inadvertent disclosures and premature decisions, the Department is currently not disclosing how many applicants already provide transportation assistance or meet the recommendations articulated in the March NOFO. More information about CHIPS for America's commitment to protecting confidential business information (CBI) can be found here: *https://www.nist.gov/chips/handling-confidential-information.*

Question 3. How many firms applying for CHIPS funding already provide housing assistance that, in the view of your agency, meets the recommendations articulated in the NOFO? Please list the firms.

Answer. The Department is currently evaluating applications and treats information submitted by applicants as confidential. To avoid any inadvertent disclosures and premature decisions, the Department is currently not disclosing how many applicants already provide housing assistance or meet the recommendations articulated in the March NOFO. More information about CHIPS for America's commitment to protecting confidential business information (CBI) can be found here: *https://www.nist.gov/chips/handling-confidential-information.*

Question 4. How many firms applying for CHIPS funding already provide paid leave that, in the view of your agency, meets the recommendations articulated in the NOFO? Please list the firms.

Answer. The Department is currently evaluating applications and treats information submitted by applicants as confidential. To avoid any inadvertent disclosures and premature decisions, the Department is currently not disclosing how many applicants already provide paid leave or meet the recommendations articulated in the March NOFO. More information about CHIPS for America's commitment to protecting confidential business information (CBI) can be found here: *https://www.nist.gov/chips/handling-confidential-information.*

Question 5. Yes or no: Did the Commerce Department conduct any type of fiscal or economic analysis when it decided to add the provisions described above?

a. If yes, did such analysis include how much it would cost chipmakers to provide these benefits to their employees?

Answer. Recruiting, training, and retaining a large, skilled, and diverse workforce will be critical to strengthening the U.S. semiconductor ecosystem. Delivering on the program's national and economic security objectives demands major investments in the semiconductor workforce that will support good-paying jobs across the industry.

Recognizing this, Congress in the CHIPS and Science Act directed the Department to include workforce development requirements in awarding semiconductor incentives. The statute requires that the Department issue awards only to applicants who have "made commitments to worker and community investment" including "training and education benefits paid by the" applicant and "programs to expand employment opportunity for economically disadvantaged individuals." 15 U.S.C. § 4652(a)(2)(B). The statute also requires funding recipients to "secure[] commitments from regional educational and training entities and institutions of higher education to provide workforce training," as well as to document and develop a strategy to meet workforce needs." 15 U.S.C. § 4652(a)(2)(B). Finally, the statute explicitly states that CHIPS funding may be used to support workforce development. See 15 U.S.C. § 4652(a)(4)(B).

Consistent with this statutory mandate, the first funding opportunity requires applicants to submit workforce development plans for the workers who will operate their facilities and the construction workers who will build them.

The CHIPS Program Office has released *a workforce development planning guide* that offers more details on these requirements as well as other workforce-related provisions in the first funding opportunity, including the requirement for applicants requesting direct funding over $150 million to submit a plan to provide their facility and construction workers with access to child care. *A summary of key workforce provisions* is available on the CHIPS website.

Question 6. Yes or no: Did the Commerce Department analyze the cost to applicants to use 100 percent renewable energy for facility operations and whether this recommendation could be achieved in practice?

Answer. As stated in the Notice of Funding Opportunity: CHIPS Incentives Program—Commercial Fabrication Facilities, all applicants are encouraged to make use of renewable energy to the maximum extent possible for operation of their projects, and applicants constructing a new facility for fabricating semiconductors are strongly encouraged to use 100 percent renewable energy for facility operations. This is a recommendation, not a requirement, and is only one factor among many considered by CPO when reviewing applications. Without knowing, for example, which companies will apply for financial assistance, their locations, or anticipated demand

for energy, it would not have been possible for CPO to conduct a cost analysis at the time the NOFO was issued. CPO will work closely with each applicant to determine what is technologically and economically feasible in terms of implementing this recommendation.

Applicant Selection Methodology

The first tranche of CHIPS grants are expected to be announced this fall. Although the CHIPS Program Office (CPO) has held briefings and released materials about how to navigate the NOFO application process, it has not published its methodology for selecting applicants, including how heavily specific application components will be weighed.

Question 1. Please provide a blank pre-application and full application for commercial fabrication facility applicants for the record.

Question 2. What is your agency's methodology for selecting successful applicants? Please provide the metrics or points system that informs the CPO's selection process, and describe how the CPO developed this methodology.

Question 3. How are you weighting March NOFO application components that were not included in the CHIPS and Science Act (*e.g.,* plans for workforce development and childcare services, and NEPA review) against other application components, such as finances and feasibility? Please describe.

Answer. Applicants can find information on how to complete the pre-application and application—as well as several resources, including webinars and template financial models—on the website. The pre-application and application consist of structured data in the application web portal and the questions that can be found in the CHIPS Incentives Program—Commercial Fabrication Facilities, Notice of Funding Opportunity (NOFO) issued on February 28, 2023. There is accordingly no "blank pre-application and full application."

CPO undertakes a rigorous application review process to select successful applicants. CPO conducts a merit review process assessing whether projects are eligible for the CHIPS Incentives Program and the strengths and weaknesses of projects against the six criteria listed below. The evaluation will be qualitative, not numerical. The first criterion—the extent to which the application addresses the program's economic and national security objectives is of primary importance and receives the greatest weight. The remaining five criteria will receive approximately equal weight. Applications will only be recommended for award if each criterion is adequately addressed in the application materials. If an application is deficient in one or more areas, the applicant may be requested to make certain revisions in order to continue in the review and selection process.

(1) Economic security objectives will assess how an application advances security by building sustainable domestic capacity that reduces U.S. reliance on vulnerable or overly concentrated production.

(2) National security objectives will assess whether applicants address national security considerations, including by securing supply chains for technologies used by government organizations and their contractors. In addition, it will assess a project's operational vulnerabilities and resilience to threats from foreign entities of concern.

(3) Commercial viability addresses the project's long-term commercial viability to ensure there is a reasonable market environment and demand for the project's output.

(4) Financial strength addresses the project's financial strength and its ability to withstand stress in market downturn conditions.

(5) Technical Feasibility and Readiness addresses the feasibility of execution of the project from construction to ongoing operational execution and maintenance.

(6) Broader Impacts addresses the degree to which the proposed project will provide broader public impacts.

The prioritization and selection factors for selecting applications for funding are below and all citations refer to the Notice of Funding Opportunity. The Department will give significant primary weight to the first factor in prioritizing applications in the review and selection process.

(a) Contribution to economic and national security, consistent with strategic goals described in Section I.C.1 and the evaluation criteria described in Section V.A.1

(b) Efficient use of taxpayer dollars, as described in Section I.C.3 and the evaluation criteria in Section V.A.3

(c) Creation of broader impacts, consistent with the description in Section I.C.6 and the evaluation criteria in Section V.A.6

(d) Extent to which the applicant is prepared to proceed to execution

(e) Whether the project will produce chips for critical infrastructure

(f) Whether the applicant, or a corporate affiliate of the applicant, has previously received financial assistance in this program

(g) Whether the project duplicates other projects funded by the Department or other Federal agencies

(h) Diversity of awards in the program, including based on geographic location of facilities receiving support and the size of awards.

Small-Scale NOFO

In September, the CPO released a long-awaited NOFO tailored for small businesses and small-scale projects. During a briefing to Congressional staff, a member of CPO indicated that the team is not prepared to provide thousands of grants to smaller companies, and "strongly encouraged" applicants to apply as a consortium. These consortia may include groups that would not normally qualify for CHIPS funding, such as "workforce training providers, labor unions, economic development corporations, institutions of higher education, philanthropic foundations, industry organizations, Tech Hubs, or other relevant entities."[1] Requiring smaller companies to develop consortia to be competitive in the application process places an undue burden on parts of the semiconductor supply chain that the CHIPS Act was intended to strengthen.

Question 1. Please describe how the CPO decided which organizations should be represented in a consortium.

Answer. The Commerce Department's CHIPS Program Office's second Notice of Funding Opportunity (NOFO), released September 29, 2023, seeks applications for smaller-scale projects involving the construction, expansion, or modernization of semiconductor materials and manufacturing equipment facilities for which the capital investment falls below $300 million. These applicants play a vital role in producing the inputs necessary for producing semiconductors in the United States, support our domestic manufacturing ecosystem, and create jobs and opportunities in communities across the country. These projects will produce the equipment, chemicals, gases, and other materials that are critical to manufacturing semiconductors in America.

The Department will seek applications that advance any of the three goals outlined in the Vision for Success. For projects advancing the third goal—supporting vibrant U.S. fab clusters—the Department encourages suppliers to consider applying as part of a consortium that promotes the development and sustainability of semiconductor clusters.

The Department has defined a cluster as a geographically compact area with multiple commercial-scale fabs owned and operated by one or more companies; a large, diverse, and skilled workforce; nearby suppliers to the semiconductor industry; R&D facilities; utilities; and specialized infrastructure, such as chemical processing and water treatment facilities. This is the kind of regional semiconductor ecosystem the Department aims to create in support of long-term U.S. competitiveness.

For the purposes of the second notice of funding opportunity, applicants that claim to support clusters are strongly encouraged to consider applying as part of a consortium. Although consortia are strongly encouraged for cluster-focused applications, the Department welcomes applications for standalone projects that meaningfully advance any of the three strategic objectives outlined above.

Applying as a consortium can be beneficial in several ways. For instance, by applying as a consortium, entities can work together to meet some of the eligibility requirements of the statute (including, for example, workforce strategy and community investments).

Given the applicants for the supply chain NOFO are smaller entities with smaller projects, the application process is designed to be much simpler and more streamlined. Applicants will fill in a Concept Plan—a very streamlined version of the pre-application—and then be asked by invitation only to participate in the full applica-

[1] *See* "Notice of Funding Opportunity (NOFO): CHIPS Incentives Program—Facilities for Semiconductor Materials and Manufacturing Equipment," *https://www.nist.gov/system/files/documents/2023/09/29/CHIPS%20$20Facilities%20for$20Semiconductor%20Materials%20and%20Manufacturing%20 Equipment%20NOFO.pdf*

tion phase. The information CPO will request will be much less intensive than in the first NOFO, including more streamlined financial information.

CHIPS for America Partner Teaming List

In June 2023, the CPO announced the CHIPS for America Partner Teaming List. This list is geared toward the "many entities interested in supporting the CHIPS Act that may not be eligible to apply on their own,"[2] including childcare providers and labor unions. In addition to providing CHIPS funding to entities the Act did not intend to fund, the Teaming List does not appear to be properly managed. Available on CHIPS's website, the List is an Excel spreadsheet; the CPO further states it is *not* "endorsing, sponsoring, or otherwise evaluating the qualifications of the entities and organizations that have self-identified for placement on the list."[3]

Question 1. How is the CPO vetting the companies and entities that appear on the Teaming List?

Question 2. Have any companies or entities been removed from, or denied listing on, the Teaming List? If so, please list which ones and why.

Question 3. Please describe the CPO's decision-making process to create a teaming list for entities that do not qualify for CHIPS funding versus those that do.

Question 4. Did you perform a cyber risk assessment regarding the use of an unvetted Excel sheet? For example, what happens if a listed company is not transparent about its funding sources or offerings, and a smaller company unknowingly partners with them on a small-scale NOFO application, per the recommendation of the CHIPS Program Office?

Question 5. How is the CPO vetting the companies and entities that appear on the Teaming List?

Question 6. Is the CPO regularly checking the excel spreadsheet for cybersecurity vulnerabilities, such as malware?

Question 7. Please describe the CPO's decision-making process to create a teaming list for entities that do not qualify for CHIPS funding versus those that do.

Answer. CHIPS for America made available a teaming partner list that will enable entities to share information, foster collaboration, and advance shared goals. This list allows entities to share their contact information and capabilities so that potential applicants can reach out and consider utilizing their expertise to advance the CHIPS Act's objectives. Teaming partner lists are common across the government and used at the Department of Energy, as an example. As stated on the website, CPO "does not evaluate the qualifications of the entities and organizations that have self-identified for placement on the list." CPO encourages "entities seeing to utilize the list [] to conduct their own due diligence of any entity they contact."

Since there are many entities interested in supporting the objectives of the CHIPS Act that may not be eligible to apply on their own, the Department of Commerce is making it easier to facilitate potential partnerships and collaboration that can advance economic and national security interests.

This list includes businesses that may not qualify as covered entities under the CHIPS funding opportunities, as well as organizations that provide support services relevant to the execution of the CHIPS incentives program. These entities can include educational and workforce training providers; childcare providers; organizations that engage or support minority-owned, women-owned, and veteran-owned businesses; community-based organizations; labor unions; and others. This list does not directly connect entities to potential applicants, but enables external entities to explore potential strategic partnerships.

CHIPS Program Accountability

In your September 19 testimony before the House Committee on Science, Space, and Technology, you said, "I think that the five-year mark is [a] really important mark, because it's the time that you know, these fabs should be coming online. And we should be making these chips at scale."[4] Although the United States cannot build manufacturing capacity overnight, five years is a long time to see results, especially when China is heavily investing in its semiconductor industry.

Question 1. What measures of success or milestones have you developed that demonstrate we are strengthening supply chain resiliency before the five-year mark?

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[2] *See* "CHIPS for America Teaming Partner List," *NIST, https://www.nist.gov/chips/chips-america-teaming-partner-list*

[3] Ibid.

[4] *See* "Full Committee Hearing—CHIPS on the Table: A one year review of the CHIPS and Science Act," *House Committee on Science, Space, and Technology, https://science.house.gov/2023/9/chips-on-the-table-a-one-year-review-of-the-chips-and-science-act*

Question 2. What benchmarks are in place to ensure that the Commerce Department will not request additional funds to meet the CHIPS program's objectives? If none exist, please describe which projects the United States should prioritize first to meet economic and national security objectives.

Answer. So many of our defense capabilities—like hypersonic weapons, drones, and satellites—depend on a supply of chips that are not currently produced in America. In 2021, car prices increased nearly 30 percent and were responsible for a third of core inflation—all because we did not have enough chips. In 2022, because Ford did not have access to enough chips—even for simple parts like windshield wipers—their workers in places like Michigan and Indiana only worked a full week three times. The chip shortage meant medical device makers did not have enough chips to produce life-saving products like pacemakers and insulin pumps. Without manufacturing strength in the United States, and the innovation that flows from it, we are at a clear disadvantage in the race to invent and commercialize future generations of technology. The CHIPS and Science Act allocated $39 billion for manufacturing incentives to encourage companies to build and expand.

As outlined in the Commerce Department's "Vision for Success: Commercial Fabrication Facilities" paper, the Department's four strategic objectives include:

- First, for leading edge logic, our goal is to both design and produce the most advanced chips here, in the United States, by the end of the decade. Right now, we manufacture zero of the world's most advanced chips on our shores. Specifically, by the end of the decade, the United States will have at least two new large-scale clusters of leading-edge logic fabs, with each cluster including multiple commercial-scale fabs, a large and skilled workforce, nearby suppliers, R&D facilities, and specialized infrastructure.
- Second, the United States will be home to multiple high-volume advanced packaging facilities. Packaging–the process of putting fabricated chips into containers that will ultimately be embedded in products–is an essential part of the manufacturing process, and one that will be core to new innovations in functionality and efficiency.
- Third, U.S.-based fabs will produce high-volume DRAM memory chips on economically competitive terms.
- And fourth, the United States will have increased its production capacity for the current-generation and mature chips that are vital to U.S. economic and national security.

The Department currently assesses that it has sufficient appropriations to meet the economic and national security objectives of the CHIPS program.

DOD Tech Hub Coordination

Last month, the Defense Department (DOD) announced $240 million in funding for eight new semiconductor "Tech Hubs." The Commerce Department is in the process of designating at least 20 of its own Tech Hubs. While all DOD Tech Hubs are funded, it is not a guarantee that all DOC Tech Hubs will receive funding.

Question 1. Please describe the coordination process between DOD and the Commerce Department to select these initial hubs.

Question 2. How will DOC ensure there is not program duplication?

Question 3. Since DOD's hubs will also serve commercial aims, how is your agency coordinating with DOD to ensure national security goals are met *and* taxpayer dollars are spent judiciously?

Question 4. As the Commerce Department selects its Tech Hubs, is the location of DOD-funded Hubs under consideration?

Answer. On October 23, 2023, the Department of Commerce's Economic Development Administration, announced the designation of 31 Tech Hubs in regions across the country. This economic development initiative is designed to drive regional innovation and create jobs by strengthening a region's capacity to manufacture, commercialize, and deploy technology.

The Tech Hubs program will help develop and grow innovative industries in diverse regions across the country in a broad array of industries that include not only semiconductors but also clean energy, critical minerals, biotechnology, and others. Tech Hubs will bring the benefits and opportunities of scientific and technological innovation to communities across the country, with nearly three-quarters benefiting small or rural areas and more than three-fourths benefiting historically underserved communities. They bring together private industry, state and local governments, institutions of higher education, labor unions, Tribal communities, nonprofits, and more to compete for implementation grants of approximately $40–70 million to fur-

ther develop these fields and make transformative investments in innovative industries.

EDA has and will continue to coordinate across the Department of Defense, including with its Office of Strategic Capital and its Defense Innovation Unit, in its implementation of the Tech Hubs program. The Tech Hubs program takes a whole-of-government approach to growing economies and strengthening national security through technology and innovation. EDA has designed its Tech Hubs funding to consider and evaluate other Federal investments, including DOD's Microelectronics Commons Hubs, in its application review to identify complementary, aligned co-investments and avoid any duplication.

Export Controls and CHIPS Program National Security Guardrails

The recently updated October 7th semiconductor export controls and CHIPS program national security guardrails share the same goal: Slowing down China's technological development.

Question 1. What steps are the Departments of Commerce and Treasury taking to ensure that these two tools are aligned and that each are fully enforced?

Question 2. Did you take the CHIPS program national security guardrails into account when developing the final export control rule? If so, how?

Answer. The Department of Commerce has designed the national security guardrails on CHIPS investments to complement export controls on advanced computing semiconductors, semiconductor manufacturing equipment, and supercomputing items to countries of concern. Both export controls and the guardrails are designed to protect national security. The guardrails apply to the expansion of certain manufacturing capacity in the People's Republic of China (PRC) by CHIPS recipients. Export controls are focused on limiting access to specific technologies and specific end-users rather than on manufacturing capacity.

BIS and the CHIPS Program Office coordinated on the development of the guardrails, which were designed to prevent most future investment in countries of concern by CHIPS recipients, and to allow existing facilities to continue viably operating to avoid disrupting existing supply chains, consistent with any applicable U.S. export control regulations.

Specifically, the final rule implementing the CHIPS guardrails refer to restrictions outlined in BIS's rules, and also take into account the technology thresholds set forth in BIS's restrictions on advanced semiconductors and semiconductor manufacturing equipment released in October 2022, and subsequently updated in October 2023. Together, export controls and the proposed national security guardrails help protect U.S. investments in technology, which will advance the national security of the United States and our allies.

CHIPS Act Section 48D Rule

The CHIPS Act added Section 48D to the Internal Revenue Code to incentivize the manufacture of semiconductors and semiconductor manufacturing equipment. Though the Treasury Department has not released its final rule, it has signaled it intends to restrict these tax incentives in a way that would make companies, such as materials manufacturers, that are eligible for Commerce Department CHIPS grants ineligible for Treasury incentives.

Question 1. Did the Commerce Department coordinate with the Treasury Department on its proposed definitions on entities eligible for Treasury Department tax incentives? Why are the definitions used by these agencies so different?

Answer. Commerce and Treasury are coordinating closely on the investment tax credit (ITC) to ensure that incentives are complementary and advance our shared economic and national security goals. The Treasury Department is in the lead of implementing the CHIPS investment tax credit (ITC) and continues working to publish its final rule.

Government Transparency

The Executive Branch is required to provide data and regularly report to Congress to facilitate the legislative branch's oversight responsibilities.

Question 1. What data from CHIPS grants applications does the CPO intend to provide to Congress?

Question 2. What information will the CPO make available to the general public?

a. What data will be provided for USASpending.gov?

Answer. The Department considers the submission of Statements of Interest (SOIs), pre-applications, or applications and the identities of applicants as confidential business information (CBI). More information about CHIPS for America's com-

mitment to protecting CBI can be found here: *https://www.nist.gov/chips/handling-confidential-information.*

CHIPS National Security Guardrails

In September, the Commerce Department released the final CHIPS guardrails rule, which is intended to limit the use of CHIPS funding for investments in countries of concern like China (88 FR 17439). The announcement accompanying the final rule states that it "prohibits recipients of CHIPS incentives funds from using the funds to construct, modify, or improve a semiconductor facility outside of the United States."[5] However, it appears that the final rule does not explicitly prohibit CHIPS Act funding recipients from investing in *new* facilities, meaning that the Clawbacks would only apply to the "material expansion" of existing facilities.

Question 1. Yes or no: Will new facilities be subject to the Clawbacks in the final rule?

Answer. The national security guardrails on CHIPS investments apply to significant transactions that involve the material expansion of semiconductor manufacturing in foreign countries of concern. The intent of the rule is to capture both existing and new construction of semiconductor manufacturing facilities.

Rice's Whales Rule Impact on Safety, Security, and the Economy

In August, NOAA entered into a stipulated settlement with environmental groups to remove millions of acres from future oil and gas leasing offshore of Texas, Louisiana, and the Gulf Coast to allegedly protect the Rice's whales. While the courts have temporarily paused these actions, NOAA is currently taking comments on the creation of a critical habitat area encompassing 28,000 square miles of Gulf of Mexico—an area larger than the entire state of West Virginia.

NOAA used a study that has not gone through peer-review as the rationale for much of the area being considered, and in large portions of the proposed area, no whale has ever been detected. NOAA estimates the total cost to the oil and gas industry, recreational and commercial fishing sectors, and the military, for consultations under the Endangered Species Act for this enormous area, will come to $24,000 per year—which is a ludicrous conclusion. Worse, the closed area overlaps with military testing grounds, and the impacts to these are barely mentioned, much less analyzed.

Question 1. Can you commit that you will review this proposed rule and, if (1) the science it is based on is not peer reviewed, (2) no whale has ever been detected in large portions of the designated area, and (3) the economic data is flawed, that you will consider withdrawing this rule to better account for science and reality?

Answer. NOAA's National Marine Fisheries Service (NMFS) is reviewing more than 41,000 public comments received on the proposed rule during the extended 74-day comment period, which closed on October 6, 2023. It would be premature to commit to withdrawing the proposed rule prior to giving full consideration to the large number of comments received from all parties. However, NMFS is committed to ensuring that any designation of Rice's whale critical habitat is based on the best scientific and commercial data available, after taking into consideration economic, national security, and any other relevant impacts. Peer review comments on the Critical Habitat Report informing the designation are available on NMFS's website at *https://www.noaa.gov/information-technology/endangered-species-act-critical-habitat-report-rices-whale-id452.* And the studies referenced in the Critical Habitat Report, and relied on in support of the proposed designation, have undergone separate peer reviews. While the Garrison *et al.,* (in review) study has not yet been published, the habitat model, the underlying data and the associated model documentation were published in two technical reports (Rappucci et al 2023, Garrison et al 2023), both of which underwent internal peer-review and are publicly available. The model results are also available for download from the National Centers for Environmental Information (NCEI GoMMAPPS) and on the Cetacean Density Mapper.

Sightings of Rice's whales are uncommon because the animal is among the rarest on the planet; however, Rice's whales have been documented visually and acoustically throughout the proposed critical habitat area, offshore of Texas, Louisiana, and Florida. The majority of sightings and acoustic detections have occurred along the Gulf of Mexico shelf break in waters 100–400 meters deep where their prey is most abundant, which corresponds with the proposed critical habitat boundaries. This past summer, there were two sightings of Rice's whales in the western Gulf within approximately 100 miles off of Galveston Texas. Rice's whales in the western

[5] *See* "Biden-Harris Administration Announces Final National Security Guardrails for CHIPS for America Incentives Program," *U.S. Department of Commerce, https://www.commerce.gov/news/press-releases/2023/09/biden-harris-administration-announces-final-national-security*

Gulf have distinctive calls and passive acoustic monitoring has confirmed year round presence of Rice's whales in the western Gulf (heard every month of the year), with them being heard an average of one day per week.

The economic analysis supporting the proposed critical habitat designation is contained in the Endangered Species Act (ESA) Critical Habitat Report. Economic impacts of critical habitat designations primarily occur through implementation of section 7 of the ESA during consultations with Federal agencies to ensure their proposed actions are not likely to destroy or adversely modify critical habitat. The analysis concludes that the proposed designation is not anticipated to result in incremental project modifications beyond those that would already occur absent designation. As a result, the economic impacts are limited to the incremental administrative costs of considering effects to Rice's whale critical habitat in section 7 consultations that would occur absent the designation. Any activities occurring within the area of the proposed designation that may affect the habitat for the Rice's whale are already required to undergo Section 7 consultation. We estimate the costs associated with the incremental administrative effort required for section 7 consultations to consider effects to Rice's whale critical habitat are approximately $240,000 over the next 10 years (discounted at 7 percent), or $37,000 in annualized costs (in 2022 dollars). NMFS's assessment of economic impacts of critical habitat designation followed a well-established process, which is summarized in the Critical Habitat Report, as informed by NMFS's ESA 4(b)(2) Policy (81 FR 7226).

Hurricane Hunter Preparedness

In late August all three of NOAA's hurricane hunters were grounded for repairs as Hurricane Idalia made landfall in Florida. Not only were all three planes grounded, but one crew had been flying back-to-back missions for 11 out of 12 days leading up to the hurricane. Flying through a hurricane is hard on both the plane and the crew. Flying this schedule is a recipe for failure, either of the plane or the crew members due to exhaustion. In *an interview on Meet the Press,* you said that that the cause of the planes going down "was routine maintenance." However, it was four days after the hurricane before any of the planes were ready to fly again—four days in which another hurricane could have very well been approaching Texas.

Question 1. Was this in fact routine maintenance, and if so, why was routine maintenance done during the height of hurricane season?

Answer. On August 16th, NOAA 42 WP–3D (NOAA 42) aircraft experienced a fuel leak in one of its wings, which resulted in necessary maintenance and prevented the aircraft from completing its final hurricane mission. Due to the urgency of the maintenance, the aircraft was flown to Waco, Texas where required outside vendors completed the repair. This maintenance was completed and accepted on September 6, 2023.

Because of the maintenance on NOAA 42, NOAA 43 WP–3D (NOAA 43) aircraft began flying twice per day using both flight crews to fully support the Idalia hurricane tasking during the latter half of August. After completing five flights out of Fort Lauderdale into Idalia, NOAA 43's generator malfunctioned causing the crew to complete onsite maintenance and cancel their final planned flight.

NOAA 49 Gulfstream-IV aircraft continued two flights per day throughout the storm series until August 28th when it experienced a failure to the pitch trim system, which is critical to keeping the plane level during flight especially at high speeds and altitudes. Fortunately, this was their final planned flight as the storm was close to making landfall and additional surveillance data was not requested. This maintenance issue did not result in any missed data collection and did not impact the forecast.

Question 2. If it wasn't routine, and was because the planes flew for two weeks through the most extreme weather imaginable, what is the Department of Commerce's plan to provide sufficient back-up to allow for these emergency repairs?

Answer. Based on the 2022 NOAA Aircraft Plan, Building and Sustaining NOAA's 21st Century Fleet, NOAA is modifying one G–550 aircraft and negotiating the option for a second G–550. NOAA also procured pre-production spots for two C–130Js, and expects to award the production contract for two green C–130Js later this year. The Administration also requested $600 million in the domestic disaster supplemental, which would complete the two green aircraft and fund another fully equipped C–130J, and avoid a gap in coverage. With this modernized and expanded fleet, NOAA will have critical backup capabilities to ensure continuous observations of storms. These aircraft are critical to tracking ever more challenging storm forecasts, as we just saw with Hurricane Otis's rapid intensification from a Tropical Storm to a Category 5 hurricane in 24 hours prior to its landfall in Mexico.

Question 3. Additionally, it's been learned that NOAA pilots have had to get waivers to allow them to fly after maxing out their allotted flight hours. Is there a plan in place to ensure that there are enough pilots to fly these missions without the need for waivers?

Answer. NOAA has made great strides in growing its NOAA Corps pilot workforce, and the FY 2025 President's Budget is a critical step to addressing that. The FY 2025 President's Budget request includes an increase of $22.9M to allow NOAA Corps to grow from an average annual strength of approximately 330in FY 2024 to approximately 374 in FY 2025. This includes growing the pilot workforce from 70 NOAA Corps aviator billets at the end of FY 2023 to 87 NOAA Corps aviator billets by the end of FY 2025. In FY 2024, NOAA's Office of Marine and Aviation Operations has six planned interservice transfers and six of the 22 officer candidates in the January 2024 Basic Officer Training Course are being assigned to aircraft. Hiring pre-qualified aviators allows NOAA to deploy these pilots in a few months instead of years, providing necessary staffing and reducing the use of high-time waivers. Fully staffing all of NOAA's aircraft will require a multi-year investment and recruitment effort to attract and retain the best pilots for vital missions like hurricane forecasting.

Question 4. During the same interview, it was reported, "we do need more resources. . .and we will continue to ask for more resources." However, the Biden budget request included $0 for hurricane hunter aircraft, but millions of dollars for woke initiatives. What is the justification for prioritizing "diverse fisheries" over the millions of lives that are at risk if hurricane forecasting is not done right?

Answer. NOAA recently awarded a pre-production contract, with funds provided in FY 2023, to secure two spots in the production line and purchase long lead materials for two C–130J aircraft. NOAA expects to award the production contract for these two green C–130Js later this year. The Administration also requested $600 million in the domestic disaster supplemental, which would complete the two green aircraft and fund another fully equipped C–130J, and avoid a gap in coverage.

Question 5. Can the Commerce Department commit to ensure NOAA is able to meet its core mission of protecting human lives and property in the future?

Answer. The Department believes that it would be unacceptable to allow lapses in coverage of the NOAA hurricane hunters mission to protect life and property, and the Department is committed to the acquisition of new aircraft with the support of Congress, which provided $327 million in supplemental Fiscal Year (FY) 2023 appropriations as requested by the Administration. Consistent with the Administration's request for $600 million in the domestic supplemental, the Department intends to have new aircraft online in 2030 when the current generation will go out of service. In addition to improvements in hurricane forecasts, the Department has continued to invest in improving forecasts of other high impact events: atmospheric rivers, wildfires, and tornadoes.

The Department also intends to continue to work closely with the U.S. Air Force (USAF) with whom NOAA shares the hurricane hunter mission; NOAA and the USAF have a combined fleet of 13 hurricane hunters to carry out critical flights that protect life and property. The Department welcomes the opportunity to continue working with Congress to ensure resources are available to meet this essential mission to protect life and property.

Port Everglades

Regarding the project to deepen and widen Port Everglades, Florida, on which NOAA-Fisheries (NMFS) is consulting under Section 7 of the Endangered Species Act, the Committee is told that NMFS may reach a Determination of Destruction or Adverse Modification (DAM) to Critical Habitat (CH) for threatened hard corals from deepening and widening project, even though the project only has the potential to impact approximately 0.09 percent of the 850,560-acre Florida Unit of Acroporid coral designated CH. To date, NMFS has not yet shared its analysis or best available scientific information that would support this potential DAM determination.

Question 1. When will NMFS share its analysis or best available scientific information to support the potential DAM determination?

Answer. During the Section 7 consultation process, NMFS works with Federal action agencies to avoid outcomes that are likely to result in either jeopardy for Endangered Species Act (ESA)-listed species or destruction or adverse modification (DAM) for designated or proposed critical habitat, or both. A determination as to whether the Port Everglades project is likely to result in DAM can only be made after conducting a thorough evaluation, including evaluating the relative importance of the area to be affected to the overall recovery of the species. The Port Everglades current impact area is estimated to contain over 700 acres of coral reefs, more than

200 acres of which are designated critical habitat for seven species of threatened coral. And the northerly portion of the Florida reef tract is especially important for coral recovery under expected climate scenarios.

Question 2. Will this allow for a final biological opinion by October 2024, which is from the most recent project implementation schedule?

Answer. NMFS understands the U.S. Army Corps of Engineers' project implementation schedule anticipates completing the ESA consultation process in November 2024. Our ability to meet that deadline will depend on when we receive the remaining information we requested, including the mitigation and monitoring implementation plan and the adaptive management plan.

Question 3. The U.S. Army Corps of Engineers hosted an Industry Day on January 28, 2023 in Ft. Lauderdale to gain information on mitigation and coral nursery options for the project. It was apparent that the coral industry could support the Corps' initial estimate for mitigation presented at Industry Day (more than 700,000 coral relocations or plantings), but even that amount of mitigation would require extensive collaboration among the coral industry. Please provide the Committee with information from NMFS on how additional outplantings realistically could be accomplished in line with NMFS suggestions of somewhere between 1.5 and 6.2 million corals, given that the industry does not exist to meet these higher suggested outplantings.

Answer. NMFS shares the Committee's concern that mitigating extremely large impacts to corals and coral reefs with coral outplanting would be costly and complicated. NMFS has suggested that the Corps re-evaluate potential engineering solutions that could be more cost-effective and risk-averse, such as pumping dredged sediment directly to the Ocean Dredged Material Disposal Site, to reduce the scale of impact of the project and avoid and minimize impacts to coral reefs. USACE is in the process of developing a Supplemental Environmental Impact Statement, and NMFS intends to continue to work collaboratively with the USACE and the State of Florida to refine impact estimates and plan for mitigation that is both feasible and effective.

Broadband Programs

Recent reports, including the September 2023 *Red Light Report,* raise concerns that rather than fulfilling its mission to connect the unserved to the internet, the Department may be focusing its efforts on discriminatory technology mandates, funding wasteful duplication in areas that already have broadband service, and adopting extralegal requirements to achieve a left-wing social agenda.

Question 1. The Infrastructure Investment and Jobs Act (IIJA) expressly prohibits the regulation of broadband prices. Do you agree that requiring broadband providers to offer specific prices or pricing tiers to participate in government funded programs is a form of rate regulation?

Answer. IIJA expressly provides that nothing in the statute should be construed to authorize NTIA to regulate the rates charged for broadband service and, consistent with that statutory provision, NTIA is not engaged in rate regulation. IIJA also states that "[t]he persistent 'digital divide' in the United States is a barrier to" the Nation's "economic competitiveness [and the] equitable distribution of essential public services, including health care and education." Accordingly, IIJA itself requires BEAD Program subgrantees to offer at least one "low-cost broadband service option for eligible subscribers." Under the statute, Eligible Entities must consult with NTIA and propose a definition of "low-cost broadband service option" to NTIA for approval. Satisfying this definition is a condition for subgrantees' receipt of BEAD funding. Requiring, as the statute does, that providers receiving a BEAD grant offer a low-cost service offering is not rate regulation; it is a grant condition and a requirement of Federal law.

Question 2. NTIA staff have reportedly pressured states to include certain rate requirements in their state BEAD plans as a condition of the Department's approval. Have NTIA or Department of Commerce officials, including regional representatives such as state-based Federal program officers, told or encouraged state broadband offices to include any of the following types of price controls in order to gain Commerce approval of the state's BEAD plan? Please indicate yes or no for each of the following types of price controls:

a. Price caps corresponding to speed tiers;

b. Rate freezes;

c. Specified prices for "low-cost" plan, "middle-class affordability" plan, or another broadband plan.

Answer. Consistent with IIJA's prohibition on rate regulation, NTIA is not engaged in rate regulation. NTIA is working with Eligible Entities to implement the IIJA requirement that BEAD Program subgrantees offer at least one "low-cost broadband service option for eligible subscribers." Under the statute, Eligible Entities must consult with NTIA and propose a definition of "low-cost broadband service option" to NTIA for approval. In connection with that, I understand that NTIA and Department of Commerce officials have told state broadband offices that they will need to comply with the low-cost option statutory requirement consistent with IIJA and the BEAD NOFO, neither of which impose any kind of price control.

Question 3. Please provide the guidance that NTIA and/or Department officials have provided to state broadband offices concerning the types of price controls listed below. If NTIA and/or Department officials' guidance varies, please provide direct quotes from a representative sample of the guidance for each type of price control listed below, including public and private communications (including e-mails) to state broadband offices.

a. Price caps corresponding to speed tiers;

b. Rate freezes;

c. Specified prices for "low-cost" plan, "middle-class affordability" plan, or another broadband plan.

Answer. NTIA is working with Eligible Entities to implement the IIJA requirement that BEAD Program subgrantees offer at least one "low-cost broadband service option for eligible subscribers." Under the statute, Eligible Entities must consult with NTIA and propose a definition of "low-cost broadband service option" to NTIA for approval. With respect to that statutory requirement, I understand that communications from NTIA and Department of Commerce officials to state broadband offices regarding the low-cost broadband service option requirement have been consistent with IIJA, the *BEAD NOFO,* the *BEAD Program Frequently Asked Questions and Answers,* and the *BEAD Program Initial Proposal Guidance documents.*

Question 4. Please provide all studies, papers, and other economic literature, if any, supporting the NTIA and/or Commerce officials' guidance on prices indicated in your response to question 14(c).

Answer. IIJA expressly provides that nothing in the statute should be construed to authorize NTIA to regulate the rates charged for broadband service and, consistent with that statutory provision, nothing in the NOFO or NTIA's guidance regulates rates.

NTIA is working with Eligible Entities to implement the IIJA requirement that BEAD Program subgrantees offer at least one "low-cost broadband service option for eligible subscribers." With respect to that statutory requirement, NTIA's NOFO and guidance have explained that states have considerable discretion in how they address it. The guidance cited in response to the above question includes, as one example, a low-cost option that draws from the Affordable Connectivity Program levels established by Congress in IIJA.

The Department recognizes the importance of congressional oversight of our broadband connectivity activities. The Department is willing to brief the Committee on its efforts to ensure networks constructed using the BEAD funds are accessible and affordable.

Question 5. Broadband availability is only lacking in extremely remote areas, where there are fewer potential customers to fund maintenance of grant-funded projects. Does the Department expect grant recipients to be able to maintain broadband service without further subsidies from the government?

a. If not, can you please provide the Department's estimates of the total amount of funding needed in the future to continue to subsidize BEAD areas?

b. If yes, can you please provide the estimated returns based on a mix of price cap plans by Commerce officials and the expected revenues for companies that build BEAD projects?

Answer. The National Broadband Map shows that there are unserved and underserved locations in every state, territory, and the District of Columbia in urban, suburban, and rural communities. We expect that a diverse array of subgrantees will seek to provide service to those unserved and underserved locations through participation in the BEAD Program. Those subgrantees will deploy service using an array of technologies pursuant to business plans that are unique to their situations and underlying cost structures. We fully expect subgrantees to seek BEAD funding sufficient to support their long term business interests, and, consistent with the BEAD NOFO, NTIA will continue to encourage Eligible Entities to minimize BEAD funding outlay, extend the reach of the BEAD program funding and help to ensure that

every unserved location and underserved location in the United States has access to reliable, affordable, high-speed Internet service.[6]

Question 6. What is the Department's estimated percentage of customers who will subscribe to BEAD-funded broadband service, and is this estimate the same in areas where BEAD projects will overbuild available fixed wireless and satellite connectivity?

Answer. NTIA expects strong adoption and subscription across BEAD-funded broadband networks, as those networks will bring affordable, reliable high-speed Internet service to locations that currently lack access. Rates of adoption and subscription will vary based on, among other things, the affordability of the service and customer demographics.

Question 7. In response to Senator Budd's concern about the Department's demonstrated bias for fiber technology in its *Notice of Funding Opportunity* and his question about whether it is better to spend $500 for satellite or $200,000 for fiber, you said, "It depends on the quality." If satellite broadband service can meet the speed and latency requirements for the BEAD program as established in the IIJA—not less than 100 megabits per second for downloads and 20 megabits per second for uploads with latency sufficiently low to allow for reasonably foreseeable, real-time, interactive applications, what are the quality difference(s) between satellite and fiber that justifies paying 400 times more for the latter?

Answer. There is no "one-size-fits-all" approach to broadband deployment given each Eligible Entity's unique challenges, and NTIA will ensure that the Eligible Entities have flexibility in identifying the technical solutions that meet the needs of their communities.

The BEAD NOFO recognizes the unique characteristics of fiber to "ensure that the network built by the project can easily scale speeds over time to. . .meet the evolving connectivity needs of households and businesses" and "support the deployment of 5G, successor wireless technologies, and other advanced services."[7] The BEAD NOFO, however, creates room for all strategies and we expect Eligible Entities will use a mix of technologies to connect their unserved and underserved locations. The NOFO allows applicants to propose to provide service over any form of reliable broadband service, including terrestrial fixed wireless over licensed spectrum in certain circumstances, so long as the service can fulfill the statutory speed and latency requirements. Further, each Eligible Entity will set an "Extremely High Cost Per Location Threshold" and may decline to select a Priority Broadband Project proposal "that requires a BEAD subsidy that exceeds the Extremely High Cost Per Location Threshold for any location to be served in the proposal if use of an alternative Reliable Broadband Service technology meeting the BEAD Program's technical requirements would be less expensive."[8] It also permits funding of satellite and unlicensed wireless service for those locations if there is no other proposal from a provider of Reliable Broadband Service.[9]

Question 8. You and Assistant Secretary Davidson claimed that states will have flexibility to deploy a variety of technologies. Your claims, however, are at odds with your agency's actions. For example, Commerce's rules prohibit states from funding non-fiber projects without a waiver from NTIA while allowing BEAD dollars to overbuild certain technologies on a blanket basis. Will you revise BEAD guidance and eliminate those rules and others that are biased towards certain technology?

Answer. It is not correct that Commerce's rules prohibit states from funding non-fiber projects without a waiver from NTIA. Applicants can propose to provide service over any form of reliable broadband service. Eligible Entities each have the authority to decline to select a Priority Broadband Project proposal "that requires a BEAD subsidy that exceeds the Extremely High Cost Per Location Threshold for any location to be served in the proposal if use of an alternative Reliable Broadband Service technology meeting the BEAD Program's technical requirements would be less expensive." Further, NTIA expects that there will be a significant number of locations where the only proposals are not Priority Broadband Projects (*i.e.,* not end-to-end fiber) and Eligible Entities are not required to seek a waiver to fund such projects.

The BEAD NOFO takes this approach because there is no "one-size-fits-all" approach to broadband deployment given each Eligible Entity's unique challenges, and

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[6] National Telecommunications and Information Administration; Notice of Funding Opportunity; Broadband Equity, Access, and Deployment Program at 20, 22, available *https://broadbandusa.ntia.doc.gov/sites/default/files/2022-05/BEAD%20NOFO.pdf* (herein "BEAD NOFO").

[7] *Id.* at § 60102(a)(2)(I).

[8] NOFO at 38.

[9] *Id.*

NTIA will ensure that the Eligible Entities have flexibility in identifying the technical solutions that meet the needs of their communities.

Question 9. In the *BEAD NOFO,* NTIA instructed states "to set the Extremely High Cost Per Location Threshold as high as possible to help ensure that end-to-end fiber projects are deployed wherever feasible." Please provide the guidance that NTIA and/or Department officials provided to state broadband offices regarding how high to set the Extremely High Cost Threshold. If NTIA and/or Department officials' guidance varies, please provide direct quotes from a representative sample of the guidance provided, including public guidance and private communications (including e-mails) to state broadband offices. [10]

Answer. I understand that communications from NTIA and Department of Commerce officials to state broadband offices regarding the extremely high cost per location threshold have been consistent with IIJA, the BEAD NOFO, the BEAD Program Frequently Asked Questions and Answers,[11] and the BEAD Program Initial Proposal Guidance documents.[12]

Question 10. Will you clarify to states that if satellite and other broadband technologies can meet the requirements established in BEAD, that they should weigh the costs appropriately rather than automatically preference fiber to better ensure that all Americans can receive broadband service through this funding?

Answer. Consistent with the underlying statute, the BEAD NOFO recognizes the unique characteristics of fiber to "ensure that the network built by the project can easily scale speeds over time to . . . meet the evolving connectivity needs of households and businesses" and "support the deployment of 5G, successor wireless technologies, and other advanced services." [13]

There is no "one-size-fits-all" approach to broadband deployment given each Eligible Entity's unique challenges, and NTIA will ensure that the Eligible Entities have flexibility in identifying the technical solutions that meet the needs of their communities. The NOFO recognizes the unique characteristics of fiber to "ensure that the network built by the project can easily scale speeds over time to . . . meet the evolving connectivity needs of households and businesses" and "support the deployment of 5G, successor wireless technologies, and other advanced services." The BEAD NOFO, however, creates room for all strategies and we expect Eligible Entities will use a mix of technologies to connect their unserved and underserved locations. The NOFO allows applicants to propose to provide service over any form of reliable broadband service, including terrestrial fixed wireless over licensed spectrum in certain circumstances. It also permits funding of satellite and unlicensed wireless service for the locations that each state identifies as the most expensive to serve.

Question 11. Please provide the specific methodology that the Department used to determine the high-cost portion of BEAD funding allocations.

Answer. IIJA tasked NTIA with defining "high-cost areas" as part of the BEAD allocation formula. To qualify as a high-cost area, IIJA requires the area to contain at least 80 percent unserved locations. As a result, census block groups that both met the "high-cost" definition and contained at least 80 percent unserved locations are eligible to be designated as a high-cost area. In accordance with IIJA's mandate, NTIA defined "high cost" using a cost model that incorporates an area's remoteness, population density, topography, and poverty levels, and that measures costs over the life of the network. For example, NTIA's model accounts for the fact that remote areas will face additional costs for broadband deployment and that unique topography can often make broadband deployment more difficult and costly. In addition, the model relies on the average cost of building out broadband service in unserved areas, utilizing the net present value over the lifetime of the network, not just the cost of construction. NTIA defined "area" to mean census block groups.

Question 12. Please list the total amount of high-cost BEAD funding that was allocated to states or other eligible entities.

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[10] "Notice of Funding Opportunity: Broadband Equity, Access, and Deployment Program." *National Telecommunications and Information Administration (NTIA). https://broadbandusa.ntia.doc.gov/sites/default/files/2022-05/BEAD%20NOFO.pdf*

[11] Broadband, Equity, Access, and Deployment (BEAD) Program Frequently Asked Questions and Answers Version 4.0 at 8 (item 1.18,) available at *https://broadbandusa.ntia.doc.gov/sites/default/files/2023-11/Broadband_Equity_Access_Deployment_Program_Frequently_Asked_Questions_Version_4.0.pdf.*

[12] Broadband Equity, Access, and Deployment (BEAD) Program Initial Proposal Guidance at 49–51, available at *https://broadbandusa.ntia.doc.gov/sites/default/files/2023-10/BEAD_Initial_Proposal_Guidance_Volumes_I_II_10-2023.pdf.*

[13] IIJA at § 60102(a)(2)(I).

Answer. NTIA, as directed by statute, allocated ten percent of the BEAD Program budget—$4.245 billion—in high-cost BEAD funding based on the number of unserved locations in high-cost areas.[14]

Question 13. What specific actions has Commerce taken in response to the Department of Commerce Office of Inspector General Management Alert concerning increased fraud risk in the Tribal Broadband Connectivity Program (TBCP) published on July 10, 2023?

Answer. Across all broadband programs, NTIA has been actively working with the Department's Office of Inspector General (OIG) team to bolster controls against waste, fraud, and abuse. In the TBCP program, Congress directed NTIA to address the urgent needs of Tribal communities to access broadband for basic needs, like learning, telework, and healthcare. NTIA is working to faithfully implement this urgent, bipartisan priority, so that Tribal communities can have affordable, high-speed broadband and taxpayer dollars are used responsibly.

NTIA has taken several steps to ensure taxpayer funds remain directed to Tribal areas where the need is greatest, consistent with Congress's intent. NTIA has begun using the new FCC mapping data, rather than Form 477, which is more granular data than ever before on service availability. NTIA has also standardized its mapping analysis and protocol for verifying service for each applicant. And it has also standardized the de-duplication process its partner agencies by instituting protocols for coordinating with the FCC, USDA, and Treasury to identify and address potential duplication for each potential awardee.

NTIA also consulted with the OIG on the next round of TBCP funding and the second TBCP NOFO (NOFO II), which NTIA released in July 2023.[15] NTIA incorporated improvements from the NOFO I process and other enhancements, including more robust broadband service verification and deduplication processes. NOFO II also incorporates feedback from the OIG concerning disclosures, reporting, whistleblower protections, and enforcement provisions. These improvements also respond to OIG recommendations to formalize NTIA policies and procedures for verifying Tribal government certifications.[16]

In addition to these examples, NTIA continues to develop and enhance protocols to protect against waste, fraud, and abuse.

Question 14. Have Commerce officials reviewed all previously awarded grants in the TBCP to check for potential overlap with other Federal programs?

a. If so, how many awards have been identified as overlapping with another Federal award?

b. How many awards have been revoked because they overlapped with another Federal award?

c. What the is total amount of funding revoked?

Answer. NTIA administers the Tribal Broadband Connectivity Program (TBCP). NTIA recognizes the importance of ensuring that TBCP funds are directed where they are most needed. NTIA is working with other agencies to take steps to address concerns about potential overlap. Those actions could include measures like applying special award conditions or amending the scope of awards.

Question 15. What contractor(s) has NTIA hired to assist with broadband programs?

a. Please list contractors separately by program.

b. Please indicate the specific task each contractor is responsible for.

c. Please indicate the office that oversees the contractor(s).

Answer. NTIA has several contractors that provide professional and technological support services for NTIA's broadband grant programs. These contracts are managed and overseen in NTIA's Office of Internet Connectivity and Growth (OICG), the office that manages NTIA's broadband grant programs.

NTIA's professional services contracts for grants programs—including the Broadband Infrastructure Program (BIP), the Tribal Broadband Connectivity Program (TBCP), the Connecting Minority Communities (CMC) Program, the

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[14] IIJA § 60102(c)(1)(A).

[15] NOFO II, available at *https://ntia.gov/sites/default/files/2023-07/ntia-tbcp-round2-nofo.pdf*. This NOFO also incorporates the definition of affordability found in the BEAD NOFO and includes a definition of reliability.

[16] Tribal Government Certifications allow applicants to attest to the "unserved" status of proposed service areas within Tribal Lands, and lands providing services to Tribal members, with a description of how the Tribe determined that the area is "unserved." *Id.* at page 6–7. The second NOFO details accompanying requirements when applicants choose to submit a Tribal Government Certification.

Broadband Equity, Access, and Deployment (BEAD) Program, the Digital Equity Act Programs, and the Enabling Middle Mile Broadband Infrastructure Program (Middle Mile)—partner with Deloitte Consulting and Corner Alliance. These contracts include program administration, communications and outreach, grants administration, technical assistance, environmental and historic preservation support, pre- and post-award grants administration and monitoring support, program management support, and data analytics and management tools support.

In addition, NTIA has contract with Software Information Resource Corp (SIRC) for the development and implementation of a Salesforce solution for both customer relationship management (CRM) and a programmatic grants management platform for application intake and review as well as post award report intake, review, and monitoring activities. This contract primarily supports the BEAD, Digital Equity, and Middle Mile programs, but facets of this solution also support NTIA's broader CRM and stakeholder engagement activities across all of its broadband grant programs, including BIP, CMC, and TBCP.

NTIA has a contract with CostQuest Associates to obtain statutorily required datasets, specifically the Broadband Fabric, which is also used by the Federal Communication Commission's new broadband maps, as well as broadband cost data and analytics professional services, to support analytics efforts for NTIA and for States. (NTIA has built a BEAD Eligible Entity Toolkit with access to these datasets and analytical tools as a part of its Technical Assistance efforts). Although BEAD is the primary grant program using this data set and analytics tool, it is also used for NTIA's infrastructure grant programs, including BIP, Middle Mile, and TBCP. Additionally, the Broadband Fabric and broadband cost data is available to other Federal agencies and the Eligible Entities through NTIA's contract. To support the use of this data set and analytics tools, NTIA also has a contract with ArcGIS, a web-based mapping platform, leveraged by NTIA's National Broadband Availability Map (NBAM), but also used to support all of its broadband grant programs, to provide data analytics insights on broadband availability, adoption, and use—as well as other socio-economic layers that have been integrated in to the NBAM platform. NTIA also has a contract with INSPIRE to support its stakeholder outreach and engagement events and activities (*e.g.,* webinars, conferences) as well as its grant program Technical Assistance events.

NTIA Organization

The Commerce Department has reserved $849 million from the BEAD program for administration costs.

Question 1. Please explain in detail what costs the Commerce Department is incurring for BEAD, including all expense categories over $1 million. For funding that does not yet have a plan for expenditure, please note as such.

Answer. NTIA operates the BEAD Program within its relevant budgetary cap and will continue to do so moving forward. NTIA's current projections have active BEAD sub-grant projects through FY32. In FY23, NTIA secured the contract resources noted above and hired professional staff to serve as Federal program officers working directly with the states and territories to support the long-term needs of the program.

Question 2. If the Commerce Department determines that it does not need the full $849 million for BEAD's administration, will it send this funding to states that cannot meet their 100 percent connectivity goal with their current allocations?

Answer. Given the complexity, length, and size of the NTIA's broadband programs and the needs for implementation Technical Assistance and strong oversight and monitoring, NTIA does not anticipate having remaining funds (at least sufficient for potentially allocating to States to compensate any States falling short of their 100 percent connectivity goal) at the closeout of the program. Further, NTIA will not know if there will be availability of funds until at least 2030, when NTIA anticipates State subgrantees will start closing out on their projects. It is important to note that NTIA expects States will be able to leverage other broadband infrastructure Federal funding, including those programs administered through the Federal Communications Commission, U.S. Department of Agriculture, and Department of the Treasury, State-funded grant programs, as well as private sector investment, to meet the 100 percent connectivity goal, along with the Federal investments from BEAD.

Question 3. Please provide the organization chart for NTIA, including all offices and every position within each office, even if a position is currently vacant (note such positions as such).

Answer. See attachment #1

Question 4. For each position identified in the chart provided in response to question 14(c), please provide the position's full description, including goals and expectations for the Senior Advisor for Algorithmic Justice in the Office of the Assistant Secretary of NTIA.

Answer. The position description for the Senior Advisor for Algorithmic Justice is below:

Works with Administrator and staff on:

- Thought leadership on Internet of things, algorithmic transparency and justice, and smart cities.
- Thought leadership with respect to data analytics in energy, transportation, resilience planning, broadband, and other areas covered by the IIJA. In particular, projects concerning how government and private parties can work together on digital infrastructure in the public interest, with a view to increasing trust, and best practices around ethical AI and algorithmic innovation.
- Thought leadership with respect to information structures supportive of democratic practice, including decentralized authentication, civic information and engagement, online harm reduction, and journalism support.

Spectrum

Expanding commercial access to midband spectrum is critical to our Nation's economic growth and security. Unfortunately, large swaths of our Nation's midband spectrum is controlled by Federal agencies that do not want to share.

Question 1. The Infrastructure Investment and Jobs Act (IIJA) provided $50 million for DOD to study the feasibility of allowing commercial wireless services to operate in the 3.1–3.45 GHz band. While the study has not been publicly released, initial reports suggest that DOD has found that little or no spectrum in the band could be repurposed for commercial wireless services. Is that correct?

Question 2. If DOD needs more money to free up spectrum in the lower 3 GHz band, how much more does it need?

Question 3. Did the study calculate the gap in funding that would need to be filled in order to make repurposing feasible, or did it simply conclude that it isn't feasible?

Question 4. Beyond the lower 3 GHz band, what other mid-band spectrum frequencies currently occupied by DOD or other Federal agencies could be repurposed for commercial wireless services?

Answer. The National Telecommunications and Information Administration (NTIA) has a dual imperative built into its statutory role. NTIA is both the manager of Federal spectrum resources, and the President's primary advisor on these issues. Given these dual roles, NTIA's obligation is to work with the agencies to ensure that we have the spectrum needed for our economic security and growth while protecting national security and critical Federal missions and capabilities. To meet this obligation, it is absolutely essential that bands be studied before decisions are made about repurposing.

On September 28, 2023, the Department of Defense submitted its Emerging Mid-Band Radar Spectrum Sharing (EMBRSS) Feasibility Assessment to the Department of Commerce. Consistent with the statutory requirement, the Department of Commerce has been reviewing the 1200-page report—which includes numerous classified annexes—and is coordinating with the DoD and other Federal stakeholders to determine the next steps beyond the EMBRSS study with the complementary goals of furthering U.S. economic competitiveness while ensuring a strong national security. The White House is actively coordinating interagency discussions on spectrum policy to ensure all options are considered to achieve the Nation's economic and national security needs.

Additionally, the National Spectrum Strategy, released on November 13, 2023, identifies over 2,700 MHz—nearly double NTIA's initial 1,500 MHz target and more than 1600 MHz of mid-band spectrum, including the lower 3 GHz and 7–8 GHz bands—of spectrum across five spectrum bands for in-depth study for potential new uses by both the private sector and federal agencies. The Biden-Harris Administration published an Implementation Plan on March 12, 2024, to carry out the Strategy, which is envisioned as a living document, intended to be assessed and updated in the future as spectrum requirements and opportunities evolve. The Implementation Plan sets out requirements for a follow-on study to the EMBRSS report.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. ROGER WICKER TO HON. GINA M. RAIMONDO

Question 1. Do you agree that it is important to enhance and balance security and assurance across all of the phases of the lifecycle of semiconductor design, manufacture, packaging, test, and use?

Answer. The Department agrees with this statement and the CHIPS program is being executed to increase domestic capacity across manufacturing, packaging, supply chain, and R&D.

Question 2. I am aware of a proposal to award CHIPS Incentive Program funding for a "secure enclave" to one company that is focused on that company's semiconductor fabrication and packaging facilities.

a. Is it the Commerce Department's view that such an award—potentially for billions of dollars—is consistent with the underlying CHIPS statute and congressional intent?

b If so, can you please cite an instance where the secure enclave concept and the possibility of such an award was discussed with Members of Congress on the relevant committees of jurisdiction prior to the enactment of the Chips and Science Act?

c. Do you believe that Members of Congress and staff on relevant committees, including the Senate Commerce, Science, and Transportation Committee and Senate Armed Services Committee, should have access to the analysis being used to support the secure enclave proposal?

Answer. Every CHIPS Act award will satisfy the requirements of the CHIPS Act. There is not a detailed communications record concerning any such discussions and deliberations on Secure Enclave that the Department is able to share. The Department recognizes the important oversight role that Congress plays here, and will continue to provide information consistent with application confidentiality considerations and legal restrictions.

Question 3. Should the Department make an award for the secure enclave proposal or any such similar proposal, do you commit to providing expeditiously to Congress the full list of otherwise meritorious applications that the Department was forced to reject for lack of available funding?

Answer. The CHIPS program is oversubscribed, and not all eligible applicants will receive CHIPS funds. The Department carefully evaluates how to allocate CHIPS funds to maximize the national security and economic security impacts of the program.

Question 4. Are you aware of the recent Department of Defense Microelectronics Quantifiable Assurance (MQA) independent review of microelectronics security, which represents a consensus view amongst 27 senior experts across government, the defense industrial base, and the semiconductor industry?

a. Are you aware that following completion of this report, the Undersecretary of Defense for Acquisition and Sustainment, Dr. William LaPlante, and the Undersecretary of Defense for Research and Engineering, Heidi Shyu, issued a press release lauding the report's conclusions and recommendations?

Answer. Yes.

b. Do you agree with the MQA independent review's finding regarding the need to further develop affordable security overlays and MQA standards and implement independent checks throughout the semiconductor lifecycle which are tailored to the type and use of the chip?

Answer. Yes.

c. Are you aware that in 2014, the Department of Defense certified a major U.S.-based manufacturer of advanced semiconductors as a "Trusted Foundry" qualified to produce classified and export-controlled chips for national security at a small fraction of the cost of the proposed secure enclave? Are you also aware that this company's most advanced fab received accreditation in May of this year as a Trusted Supplier using a flexible and affordable "security overlay" approach?

Answer. Yes, based on publicly available information.

d. Are you aware that the MQA independent review based its recommendations regarding affordable and sufficient security overlays on the methodology reflected in this recent Department of Defense security accreditation?

Answer. MQA is one among multiple approaches to secure chip production.

Question 5. I am concerned that NTIA's guidance for the BEAD program facilitated and effectively required states to propose price controls and scoring that do not align with the marketplace or reality. Will you reject state plans that propose

any rate caps which would starve BEAD-funded networks and either require ongoing government subsidies just to remain viable or to fail because they have no ability to cover operating costs?

Answer. IIJA expressly provides that nothing in the statute should be construed to authorize NTIA to regulate the rates charged for broadband service and, consistent with that statutory provision, nothing in the National Telecommunications and Information Administration's (NTIA) BEAD Notice of Funding Opportunity (NOFO) or guidance regulates rates or imposes any price controls.[17] IIJA also states that "[t]he persistent 'digital divide' in the United States is a barrier to" the Nation's "economic competitiveness [and the] equitable distribution of essential public services, including health care and education."[18] Accordingly, IIJA itself requires BEAD Program subgrantees to offer at least one "low-cost broadband service option for eligible subscribers."[19] Under the statute, Eligible Entities must consult with NTIA and propose a definition of "low-cost broadband service option" to NTIA for approval.[20] Satisfying this definition is a condition for subgrantees' receipt of BEAD funding. Requiring, as the statute does, that providers receiving a BEAD grant offer a low-cost service offering is not rate regulation; it is a grant condition and a requirement of Federal law.

Question 6. NTIA's BEAD program requires a 25 percent Letter of Credit on top of the 25 percent match. This requirement will make deployments more expensive for all providers and lead to less capital going toward broadband deployment. While I recognize the need for the government to protect the public investment, there are alternative ways NTIA can protect the public and not increase costs unreasonably for providers seeking to participate in BEAD. Is NTIA looking at alternatives to the Letter of Credit requirement? If so, will NTIA engage stakeholders to ensure the feasible of alternatives?

Answer. As NTIA administers the BEAD Program, we are committed to being good stewards of taxpayer dollars. That means making sure BEAD Program subgrantees can see their deployment projects through—not just to the end of construction, but on an ongoing basis as service providers deliver affordable, reliable high-speed Internet service. To that end, the NOFO required prospective subgrantees to provide an irrevocable standby letter of credit to the Eligible Entity (*i.e.,* the 50 states, five territories, and the District of Columbia) before entering into a subgrantee agreement. The amount of the letter of credit must be no less than 25 percent of the subaward amount.[21] The NOFO also invited Eligible Entities to propose alternatives "if they are necessary and sufficient to ensure that the Program's objectives are met."[22]

On November 1, 2023, NTIA published a conditional programmatic waiver that modifies the letter of credit requirement for subgrantees of all Eligible Entities in the following ways:

- *Allow Credit Unions to Issue letters of credit.* The NOFO requires subgrantees to obtain a letter of credit from a U.S. bank with a safety rating issued by Weiss of B– or better. The waiver permits subgrantees to fulfill the letter of credit Requirement (or any alternative permitted under the waiver) utilizing any United States credit union that is insured by the National Credit Union Administration and that has a credit union safety rating issued by Weiss of B– or better.
- *Allow Use of Performance Bonds.* The waiver permits a subgrantee to provide a performance bond equal to 100 percent of the BEAD subaward amount in lieu of a letter of credit, provided that the bond is issued by a company holding a certificate of authority as an acceptable surety on Federal bonds as identified in the Department of Treasury Circular 570.
- *Allow Eligible Entities to Reduce the Obligation Upon Completion of Milestones.* The waiver allows an Eligible Entity to reduce the amount of the letter of credit obligation below 25 percent over time, or reduce the amount of the performance bond below 100 percent over time, upon a subgrantee meeting deployment milestones specified by the Eligible Entity.
- *Allow for an Alternative Initial letter of credit or Performance Bond Percentage.* The NOFO requires that the initial amount of the letter of credit be 25 percent of the subaward (or the initial amount of the performance bond be 100 percent of the subaward under the option described above). The waiver allows the initial

[17] IIJA. at § 60102(h)(5)(D).
[18] *Id* at § 60101(2) (2021).
[19] *Id.* at § 60102(h)(4)(B).
[20] *Id.* at § 60102(h)(4)(B), (5)(B)(ii).
[21] BEAD NOFO at 72, 73.
[22] *Id.* at 71.

amount of the letter of credit or performance bond to be 10 percent of the subaward amount during the entire period of performance when an Eligible Entity issues funding on a reimbursable basis consistent with Section IV.C.1.b of the NOFO and reimbursement is for periods of no more than six months each.

By providing an expanded universe of potential issuers of letters of credit and specific, permissible alternatives to the letter of credit requirement, NTIA remains faithful to our objectives of encouraging robust participation from a broad range of service providers while giving states and territories more ways to ensure that grant recipients can build a high-quality network and operate it for years to come.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY DEB FISCHER TO HON. GINA M. RAIMONDO

As you know, the bipartisan infrastructure law directed a study to examine ways to open new spectrum frequencies without imperiling vital national security operations in the 3.1–3.45 gigahertz band. The Department of Commerce's National Telecommunications and Information Administration (NTIA) and the Department of Defense (DOD) co-chaired the study that produced a final report –submitted to the Department of Commerce (DOC) three weeks ago—including input and discussion from industry and Federal stakeholders.

During the hearing, you verbally affirmed your support of a joint briefing with the DOD to disseminate the contents of the report with members of both the Senate Commerce Committee and Senate Armed Services Committee. However, it is my understanding that the DOC and NTIA suddenly withdrew from participating in the upcoming briefing scheduled for this exact purpose. I am concerned by this development, which appears to conflict with your remarks during the hearing.

Question 1. Going forward, will you commit that the appropriate representatives from the DOC and NTIA will fully participate in scheduled briefings related to implementation of this report?

Answer. On September 28, 2023, the Department of Defense (DoD) submitted its Emerging Mid-Band Radar Spectrum Sharing (EMBRSS) Feasibility Assessment to the Department of Commerce. The Department appreciated the opportunity to have provided a briefing on November 16, 2023, to the Committee, in conjunction with the DoD, on the contents of the report after it was submitted by the DoD to the Department. The Department and its DoD colleagues are committed to working with the Committee to ensure it can perform its oversight functions related to the report.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JERRY MORAN TO HON. GINA M. RAIMONDO

AI NIST Risk Management Framework

Artificial intelligence is one of the key technology areas in the CHIPS and Science Act, and both the Department of Commerce and the Foundation have significant interest in the development of AI. Among these efforts is NIST's Artificial Intelligence Risk Management Framework, which was authorized by Congress to help establish a baseline of good practices for organizations who develop and employ AI to follow.

Question 1. How will organizations employing NIST's Artificial Intelligence Risk Management Framework be better prepared to mitigate potential risks associated with AI use, compared to organizations not using the RMF?

Answer. The NIST AI Risk Management Framework (AI RMF 1.0) offers a voluntary resource to the organizations designing, developing, deploying, or using AI systems to help manage the potential risks of AI and promote trustworthy and responsible development and use of AI systems. Released in January 2023, the AI RMF is a framework that provides a flexible, structured, and measurable process to address AI risks purposefully and continually throughout the AI lifecycle. The NIST AI RMF provides a set of outcomes that enable dialogue, understanding, and actions to manage AI risks. The Framework is intended to be voluntary, rights-preserving, non-sector-specific, and use-case agnostic, providing flexibility to organizations of all sizes and in all sectors and throughout society to implement the approaches in the Framework. The AI RMF is designed to be practical, to adapt to the AI landscape as AI technologies continue to develop, and to be operationalized by organizations in varying degrees and capacities so society can benefit from AI while also being protected from its potential harms. The NIST AI RMF has been exceptionally well-received nationally and internationally, where public and private

entities in the United States and abroad are adopting or incorporating it in their responsible AI practices. We are following up with additional resources for the implementation of the Framework, such as a companion resource for generative AI.

Workforce Challenges for High-Demand Fields

Question 1. How is the Department working to ensure that our Nation can recruit, educate, and retain the world's brightest minds that will move our technology-driven economy forward through advancement in AI, quantum computing, and other key technologies?

Answer. In the one year since the CHIPS and Science Act was signed into law, companies have announced over $166 billion in manufacturing in semiconductors and electronics, and at least 50 community colleges in 19 states have announced new or expanded programming to help American workers access good-paying jobs in the semiconductor industry. As part of the Biden Administration's long-term vision for CHIPS for America,

Secretary Raimondo has called on the United States to double the semiconductor workforce overall, for U.S. colleges and universities to triple the number of graduates in semiconductor-related fields, and for semiconductor companies to work with high schools, community colleges, and unions to train 100,000 new technicians. CHIPS for America will embrace a whole-of-society approach across government, education, labor unions, industry, and community organizations to achieve these ambitious goals.

The Department of Commerce is committed to helping more American workers compete and win in the 21st century global economy. The National Institute of Standards and Technology (NIST) Manufacturing Extension Partnership (MEP) helps businesses narrow gaps in our supply chains and make manufacturing more resilient. NIST has issued a Notice of Funding Opportunity for Manufacturing USA Workforce, Education and Vibrant Ecosystems (WEAVE) public service awards to the 17 Manufacturing USA institutes designed to engage Historically Black Colleges and Universities and other Minority Serving Institutions and rural serving institutions of higher education. NIST is currently reviewing applications and anticipates awards will be announced by the end of the calendar year.

In Spring 2024, NIST will announce a funding opportunity for a new Commerce Department-sponsored Manufacturing USA institute focused on an advanced manufacturing topic using FY23 appropriated funds. As with all Manufacturing USA institutes, there will be a program to educate and train skilled workers, working with national resources ranging from community and technical colleges to Tier 1 research universities.

NIST is also proactively supporting the Nation's workforce needs in critical and emerging technology areas. For example:

- NIST's joint institutes, JILA, the Joint Quantum Institute (JQI), and the Joint Center for Quantum Information and Computer Science (QuICS) play a critical role in educating the quantum workforce of tomorrow.
- NIST co-funds with the National Science Foundation the Institute for Trustworthy AI in Law and Society (TRAILS). TRAILS provides opportunities for training the next generation of diverse and multidisciplinary talent to tackle the opportunities and challenge that AI systems may bring.
- NIST's NICE (formerly the National Initiative for Cybersecurity Education) Program also seeks to energize, promote, and coordinate a robust community working together to advance an integrated ecosystem of cybersecurity education, training, and workforce development. In addition to engaging with stakeholders through workshops and events, the Program also published and updates the NICE Framework, a common lexicon for describing and sharing information about cybersecurity work.

The Economic Development Administration's Regional Technology and Innovation Hubs (Tech Hubs) program is working to create regional innovation centers across the country by bringing together industry, higher education institutions, state and local governments, economic development organizations, and labor and workforce partners to supercharge ecosystems of innovation for technologies that are essential to our national security and economic competitiveness. The Tech Hubs program is a key part of President Biden's Investing in America agenda, stimulating private sector investment, creating good-paying jobs, revitalizing American manufacturing, and ensuring no community is left behind by America's economic progress.

Through the Tech Hubs program, the Department is committed to strengthening economic and national security by advancing the capacities of regions to manufacture, commercialize, and deploy these technologies, guided by the following priorities: (1) making more U.S. regions strong competitors in the global innovation econ-

omy; (2) building strong communities that share in the prosperity technological innovations bring; (3) spurring the creation of new good jobs and other opportunities for workers at all skill levels; and (4) strengthening and increasing the resilience of the supply chains that our innovative technology-centric industries rely on to stay secure and competitive.

On October 23, 2023, EDA announced the 31 Phase 1 Tech Hubs designees and 29 Strategy Development Grant awardees and posted the Notice of Funding Opportunity for Phase 2. The 31 Tech Hubs focus on developing and growing innovative industries in regions across the country, including semiconductors, clean energy, critical minerals, biotechnology, precision medicine, artificial intelligence, quantum computing, and more. The Tech Hubs program required regions to bring together consortia aligned on a technology-based economic development strategy. These consortia were required to include workforce organizations such as labor unions, to ensure both the growth of a local, skilled workforce to meet the employment needs of regional technology-centric industries and the creation of quality jobs in the communities where workers live.

The Department is grateful to Congress for the $500 million in appropriations that we received in FY 2023 to catalyze investment in technologies critical to economic growth, national security, and job creation, and help communities across the country become centers of innovation. The appropriated $500 million represents only five percent of the $10 billion that was authorized through the CHIPS and Science Act. The level of interest exceeds our currently available funds, which means not every deserving applicant will be able to receive Tech Hubs designation or funding to build economic development plans to compete for future rounds of the Tech Hub program.

BEAD

Access to quality broadband is a prerequisite to rural Kansans (and rural Americans in general) participating in the type of research and development we have discussed today.

However, I am concerned that some of the recommendations that NTIA has pushed for the program in the NOFO and will be weighing in on in its coming review and approval of state broadband plans could have an adverse effect on that goal of connecting all Americans. These concerning provisions include items like labor force and pricing requirements that go far beyond what the IIJA directed.

Question 1. Can you assure us that the NTIA won't push states to include such provisions that could, in the end, limit participation in the program or hinder the ability of those who do participate to deploy broadband in the most efficient and effective manner?

Answer. NTIA is committed to the success of the Broadband Equity, Access, and Deployment (BEAD) program, and we believe the Notice of Funding Opportunity (NOFO) strikes an appropriate balance between the deployment, access, and affordability objectives established by Congress in the Bipartisan Infrastructure Law. NTIA is committed to ensuring BEAD Program participation by Internet Service Providers of all types, and continually takes steps to ensure program rules do not hinder the ability of Providers to participate, as evidenced by the changes NTIA recently undertook to the BEAD Program Letter of Credit requirements.

We will not achieve the goals of the BEAD Program without a high-skilled workforce prepared to deploy BEAD-funded networks. That is why NTIA asked states to consider workforce development strategies as part of their Initial and Final Proposals. This is not a list of requirements, but a list of considerations we urge states to think through as they consider how their state's workforce will build out high-speed Internet infrastructure.

Additionally, IIJA expressly provides that nothing in the statute should be construed to authorize NTIA to regulate the rates charged for broadband service,[23] and, consistent with that statutory provision, nothing in the NOFO regulates rates. IIJA also requires BEAD Program subgrantees to offer at least one "low-cost broadband service option for eligible subscribers."[24] Requiring, as the statute does, that providers receiving a BEAD grant offer a low-cost service offering is not rate regulation; it's a grant condition and a requirement of Federal law.

Program Flexibilities

To help make the Tech Hubs program successful across a variety of regions and technology sectors, the program's authorization in the CHIPS and Science Act is more flexible than that of many programs at EDA. For example, the statute defines

[23] *Id.* at § 60102(h)(5)(D).
[24] *Id.* at § 60102(h)(4)(B).

Tech Hubs matching funds in relation to the hub's total operating costs, unlike the Public Works and Economic Development Act's definition of cost share, which only considers the specific project expenses.

Similarly, the CHIPS and Science Act defines a range of permissible technology maturation, business assistance, and workforce development activities that are unusual under other EDA awards.

Question 1. How is the agency ensuring that its rules, reviewers, and staff are positioned so that Tech Hubs consortia will be able to make use of this flexibility to fit their regional needs and succeed?

Answer. On October 23, 2023, the Department of Commerce's Economic Development Administration (EDA) designated 31 Tech Hubs that are strengthening the country's economic and national security, and global competitiveness by enabling the industries of the future to start, grow, and remain in regions across the United States. The 31 Designated Tech Hubs are eligible to apply to Phase 2 of the program, through which EDA expects to award five to 10 Hubs Implementation awards each amounting to approximately $40 to $70 million. Each Tech Hub applied as a consortium of higher education, government, industry, economic development, labor or workforce, and other organizations focused on improving technology and innovation across the country. Of the 31 Tech Hubs, 11 received Strategy Development Grants to strengthen their consortia and mature their approach to becoming more globally competitive. EDA awarded an additional 18 Strategy Development Grants to consortia to further develop their technology-based economic development plans and achieve Tech Hubs designation in the future.

EDA has designed the Tech Hubs Phase 2 NOFO to implement its authorizing statute's flexibilities and to enable Hubs to propose and compete for funding for projects that align with each region's unique strategy and to address their unique needs. EDA has also established a new team to implement and manage the Tech Hubs program, and that team combines EDA experience with new skillsets and expertise to effectively manage the program and enable applicants, designees, and recipients.

Quantum Computing

Question 1. Are we at the point with Quantum computing that NSF or NIST or another Federal agency should be developing metrics to determine efficacy and efficiency of quantum computations?

Answer. Research and development of metrics to determine the efficacy and efficiency of quantum computations is critical to enabling hardware developers to make performance improvements to their technology. NIST staff, researchers from across the government, academia, and industry, have already begun partnering with U.S. standards organizations to explore metrics and performance benchmarking for quantum computing. For example, last year, with technical support from NIST, the industry-led, Quantum Economic Development Consortium released a report titled "Application-oriented performance benchmarks for quantum computing".

Quantum computing hardware is very different than classical computers and is advancing rapidly, so evaluating it is different and presents new challenges—meaning the performance metrics are going to be different and are still at an early stage of development. Activities are being tempered by the fact that, despite substantial advancements, the timing for the arrival of high-impact practical applications of quantum computing remains unclear. It will be important that industry, academia, and Federal agencies play a role in this research and development to ensure that developed metrics accelerate and not hinder further innovation.

Workforce Challenges for Domestic Superconducting Ecosystem

Question 1. What are the workforce shortfalls in establishing a viable domestic superconducting ecosystem and how is DOC working to address this need?

Answer. Superconductors and related technologies are important to a number of sectors, from healthcare to energy, from quantum computing to space. The need to accelerate the translation from concept to manufacturing is recognized in the 2022 National Strategy for Advanced Manufacturing. Workforce challenges in superconducting fabrication are similar to those in advanced manufacturing more broadly, including attracting, retaining, and training talent. Unique challenges include competition with the semiconductor industry for a limited talent pool and a limited availability of dedicated tools, as superconducting materials typically are not allowed in semiconductor facilities to preserve semiconductor processing quality, and dedicated space and equipment warrant additional costs.

The Department is dedicated to supporting domestic education and workforce development to enhance the Nation's competitiveness. The Department's NIST is home to the program office for the Manufacturing USA network, which helps prepare

workers for high-quality technical jobs in advanced manufacturing, including the superconducting industry. In advanced manufacturing workforce development, Manufacturing USA focuses on three priorities: equip the workforce with evolving skills, broaden access to career pathways, and spark interest in careers to secure a steady workforce talent pool.

NIST has been a leader in superconducting research for more than 50 years, playing a key role in the superconducting ecosystem talent pool for research and development and commercialization. Many graduate students, postdocs, and guest researchers are being trained in NIST laboratories, with access to cutting-edge technologies and infrastructure, as well as world-leading scientists who have made breakthrough discoveries in superconductivity and its practical applications. Many of these researchers become leaders in industry, academia, and at other national laboratories.

DOC and NSF Coordination

Question 1. In light of the MOU announced on July 26 to improve coordination between EDA and NSF on the Tech Hubs and NSF Engines programs, what specific steps are NSF and DOC taking to avoid duplication between these two programs?

Answer. The Department of Commerce's Economic Development Administration (EDA) and the National Science Foundation (NSF) are working closely on the implementation of relevant provisions of the CHIPS and Science Act. Regarding Tech Hubs and NSF's Regional Innovation Engines, EDA and NSF signed a Memorandum of Understanding (MOU) to facilitate data sharing and collaboration these two programs. Tech Hubs program is complementary to NSF's Regional Innovation Engines. Tech Hubs focuses on scaling up and commercializing products and services in key technology areas, where NSF is focusing on use-inspired research and development.

Additionally, NSF is one of the founding Federal agencies for the National Semiconductor Technology Center (NSTC) along with the Departments of Commerce, Defense, and Energy. These Federal founding members will also be a part of a Steering Committee to shape the strategy of the NSTC, including semiconductor R&D and workforce initiatives.

CHIPS Clawbacks

The CHIPS Act has strong language that allows the Commerce Department to audit grant recipients and claw back monies from firms that have been found to violate the foreign entity of concern requirements. The IRA also provided foreign entity of concern language for the 30D electric vehicle tax credit. While Treasury is still working on guidance for that portion of the bill, it is unclear whether or not there is sufficient audit and clawback authority to make sure that foreign entity of concern requirements are enforced.

Question 1. Can you comment on your Department's experience in finalizing the foreign entity of concern rules and how you expect the audit and clawback authorities to enable better stewardship of taxpayer dollars?

Answer. The Commerce Department is committed to being good stewards of taxpayer dollars. The Department fully expects all recipients of CHIPS Incentives funding to comply with the guardrails. CHIPS for America is a national security initiative, and we will enforce these guardrails to uphold our national security. We expect funding recipients to create robust programs to ensure compliance. With respect to the expansion guardrail, the funding recipient has an affirmative obligation to notify Commerce in advance of any significant transactions that could result in a material expansion of semiconductor capacity in a country of concern. If the Department learns of a potential violation of any of the guardrails, including from information provided by another Government agency, we will review to determine whether the allegation has merit, whether there is a possibility to take action that would mitigate any risk to national security, or whether we will claw back funding or take other action as appropriate.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. DAN SULLIVAN TO HON. GINA M. RAIMONDO

In July, Ranking Member Cruz (R–TX) and Senator Mark Kelly (D–AZ) successfully amended this year's National Defense Authorization Act (NDAA) to expedite NEPA approvals for semiconductor fabs utilizing CHIPS funding opportunities. Last month, in testimony before the House Science, Space, and Technology Committee, you noted that expediting NEPA approvals for projects utilizing CHIPS funding would "help us a lot to move faster."

Question 1. Can you identify other relevant areas in need of regulatory streamlining?

Question 2. In the spirit of the CHIPS Act, does the Department support regulatory and permitting streamlining for other semiconductor-relevant supply chain inputs like critical mineral development and processing, and energy development and pipelines?

Answer. The Department, in coordination with other Federal agencies, welcomes the opportunity to have a dialogue with Congress about sectors that could benefit from thoughtful regulatory efficiency while protecting the environment.

The Department is doing everything within its power to stand up a fast process for issuing CHIPS incentives. As we build out American semiconductor manufacturing capabilities, we must also maintain basic environmental protections.

On December 27, 2023, CHIPS for America program published a draft Programmatic Environmental Assessment (PEA) on the Federal Register ("Notice of Availability of Draft Programmatic Environmental Assessment for Modernization and Internal Expansion of Existing Semiconductor Fabrication Facilities Under the CHIPS Incentives Program"). The purpose of the PEA is to evaluate the environmental impacts of modernization and internal expansion projects that are eligible for the February 2023 CHIPS Incentives Program Commercial Fabrication Facilities Notice of Funding Opportunity (NOFO). The finalization of the PEA will allow CPO to complete a more streamlined NEPA review of these types of modernization projects. Comments must be received by January 25, 2024. The CHIPS Environment team is dedicated to creating an efficient and robust NEPA process. As detailed in the February 2023 NOFO, the CHIPS Program seeks to support current-generation and mature-node semiconductors facilities vital to our country's national and economic security. A streamlined environmental review will allow these upgrade and modernization projects to proceed expeditiously.

The United States is currently the world-leader in AI development, deployment, and innovation, but during a committee hearing last month on transparency in Artificial Intelligence, witnesses explained that other nations are "working harder than ever to develop the next major technological developments in AI. . ."

The thought of losing our lead in AI development raises a number of alarm bells for my colleagues and I, particularly if our lead is lost to an adversarial power like China. In briefings and roundtables that Congress has had on this topic, it has been estimated that China is somewhere between one-and-a-half to two years behind us in AI capabilities, however the recent explosion in popularity of generative AI has renewed their focus on this race. In fact, this summer the Chinese began working on the development of their own lithography machines for printing the high-tech chips needed for AI computing.

Question 1. What role does the CHIPS Act, and the Department of Commerce more broadly, have in maintaining U.S. superiority in AI development?

Question 2. Do you see any logical supply chain or computing power chokepoints relevant to the Department of Commerce that could be used to slow down China's development of AI technology?

Answer. The Department of Commerce is playing a fundamental role in the U.S. Government's policy development that shapes the design, development, deployment, and use of artificial intelligence (AI) technologies. The Department of Commerce is committed to working across the Federal government to develop AI policy that is premised on the responsible use of AI technology that mitigates negative risks and harnesses potential benefits while promoting safety and innovation. The Department engages with a variety of stakeholders, including but not limited to academia, civil society, and industry, to better understand the current AI landscape and where government can be helpful. The Department is undertaking multiple lines of effort related to A.I. policies and practices.

The National Institute of Standards and Technology (NIST) works to realize the full promise of AI as a tool that will enable American innovation, enhance economic security, and improve our quality of life. NIST has several ongoing efforts including conducting fundamental research, establishing benchmarks and metrics to evaluate AI technologies, leading and participating in the development of technical AI standards, and leading discussions both nationally and internationally on the development of AI policies. Key efforts include:

- NIST released an AI Risk Management Framework (AI RMF), which is a voluntary tool to help individuals and organizations manage risks associated with AI. NIST also hosts the NIST Trustworthy & Responsible AI Resource Center, providing access to a wide range of relevant AI resources.

- In July 2023, NIST launched the NIST Generative AI Public Working Group to spearhead the development of a cross-sectoral AI RMF profile for managing the risks of generative AI models or systems. The four program areas include: governance, content provenance, pre-deployment testing, and incident disclosure.
- The National AI Advisory Committee (NAIAC), whose members are appointed by the Secretary of Commerce, advises the President and the National AI Initiative Office on matters related to the National AI Initiative. The Committee's first-year report, required under the National AI Initiative Act of 2020, contains recommendations that include adequately funding programs under the National Artificial Intelligence Initiative Act and the NIST Trustworthy and Responsible AI Program. The Committee has also published several non-decisional documents, including one on foundational models and generative AI.
- In November 2023, NIST announced the establishment of the Artificial Intelligence Safety Institute and its Consortium (Consortium) and invited organizations to provide letters of interest describing technical expertise and products, data, and/or models to enable the development and deployment of safe and trustworthy AI systems through the AI RMF. The Federal Register notice (88 FR 75276) is the initial step for NIST to enable collaborations with non-profit organizations, universities, other government agencies, and technology companies to address challenges associated with the development and deployment of AI. The Consortium equips and empowers organizations by the establishment of a new measurement science that will enable the identification of proven, scalable, and interoperable techniques and metrics to promote development and responsible use of safe and trustworthy AI, particularly for the most advanced AI systems, such as the most capable foundation models.

As part of President Biden's Executive Order (EO) on Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence, NIST will lead in the development of guidelines and best practices to promote consensus industry standards that help ensure the development and deployment of safe, secure, and trustworthy AI systems. NIST will work in consultation with several other agencies for actions under the EO, and NIST will also continue to work with private sector, academia, and civil society stakeholders as it produces guidance called for by the EO.

On April 11, 2023, the National Telecommunications and Information Administration (NTIA) released a Request for Comment (RFC) inviting academic, industry, civil society, government stakeholders, and the public to comment on what the Federal government should be doing to promote a robust accountability ecosystem for AI and ensure that AI systems are implemented fairly and safely. The RFC sought feedback on policies that can support the development of AI audits, assessments, certifications, and other mechanisms to create responsible and trusted AI systems. It further asked whether different approaches are warranted for different industries and what other policy responses might be appropriate.

U.S. Patent and Trademark Office (USPTO) is currently studying how AI affects the patent system and intellectual property (IP). To this end, the agency created an AI and Emerging Technology (ET) Partnership, an ongoing cooperative effort between the USPTO and the AI/ET community, including academia, independent inventors, small businesses, industry, other government agencies, nonprofits, and civil society. Additionally, the agency has issued two reports on the intersection of IP and AI, including Public Views on AI and IP Policy, and Inventing AI—Tracing the diffusion of AI within U.S. Patents.

In October 2022, the Commerce Department's Bureau of Industry and Security (BIS) imposed restrictions on the PRC's access to advanced semiconductor manufacturing equipment, chips and other items needed to develop AI and prohibited U.S. persons from supporting chip development and production that power AI systems at certain semiconductor fabrication facilities located in the PRC or Macau without a license. BIS continues to assess technologies within the AI ecosystem to identify technologies necessary for control to ensure the national security of the United States. On October 17, 2023, the BIS released a package of rules designed to update export controls on advanced computing semiconductors and semiconductor manufacturing equipment, as well as items that support supercomputing applications and end-uses, to arms embargoed countries, including the PRC, and to place additional Chinese entities on the Entity List. These controls were strategically crafted to address, among other concerns, the PRC's efforts to obtain semiconductor manufacturing equipment essential to producing advanced integrated circuits needed for the next generation of advanced weapon systems, as well as high-end advanced computing semiconductors necessary to enable the development and production of technologies such as artificial intelligence (AI) used in military applications. These rules

reinforce the October 7, 2022, controls to restrict the PRC's ability to both purchase and manufacture certain high-end chips critical for military advantage.

In August 2022, the International Trade Administration (ITA) issued a RFC on Artificial Intelligence Export Competitiveness, exploring foreign regulations and potential trade barriers.

As we work with other Federal agencies to promote the safe and responsible development of A.I. here at home, we are also supporting Biden Administration efforts with likeminded allies and partners who share our values, such as anti-discrimination, privacy, and human rights.

The CHIPS and Science Act passed Congress to boost U.S. semiconductor and advanced technology manufacturing and competitiveness—specifically as it relates to China. In your testimony, you explain that the CHIPS and Science Act's success will be judged on two key criteria:

1) Whether the program enabled us to build a more resilient semiconductor industry.
2) Whether the Department of Commerce was a good steward of taxpayer dollars.

Those are two fair metrics, both of which align with Congress's intent in passing CHIPS. However, there have been ancillary policies included during implementation that do not align with congressional intent. For example:

- Requirements that applicants requesting more than $150 million provide on-or near-site child care.
- Requirements that applicants requesting more than $150 million describe their plans to provide "adult care," transportation assistance, housing assistance, and "emergency cash assistance."
- Requiring applicants to detail how they will hire "individuals whose ability or opportunity to compete in the economy has been impaired due to . . . racial or ethnic prejudice or cultural bias within American society."
- Favoring applicants who commit to pursuing "environmental justice" and use 100 percent renewable energy for facility operations.

Each of these requirements come straight from your Department's Notice of Funding Opportunity ("NOFO"). None appear anywhere in the text of the legislation as passed by Congress, and ultimately each is likely to make the U.S. *less competitive* in manufacturing semiconductors and other advanced technologies—not to mention potentially freezing out applicants from rural areas that are less developed.

This has become a pattern with this Administration: Congress comes together to pass carefully negotiated bipartisan legislation like the Bipartisan Infrastructure Bill, the Safer Communities Act, and the CHIPS Act, and then during implementation, executive agencies add on any number of partisan wish list items that stood no chance of making it through the legislative process.

Question 1. Can you cite to where in the statute gives the Dept. of Commerce the authority to require each of the bulleted examples above?

Question 2. Do you think that this sort of bait-and-switch, legislating from the agencies, is dis-incentivizing bipartisanship?

Question 3. How can you assure Congress that any authority given to the Dept. of Commerce will not be utilized as a partisan policy vehicle during implementation?

Answer. The Department is committed to successfully implementing the CHIPS for America Program and doing so in accordance with the authorities provided by Congress in the CHIPS and Science Act. To that end, the Department issued its first notice of funding opportunity (NOFO), CHIPS Incentives Program—Commercial Fabrication Facilities, on February 28, 2023. Each of the Program requirements outlined in the NOFO, including those provided in your question, is supported by the CHIPS Act and is necessary to ensure the long-term success of the CHIPS for America Program. The CHIPS Act requires that the Secretary only approve an application if the Secretary "determines that the project to which the application relates is in the economic and national security interests of the United States." It is not only appropriate but necessary for the Secretary to establish requirements to properly make that required determination. Additionally, among other provisions, the CHIPS Act provides that applicants must demonstrate that they have "made commitments to worker and community investment" including "programs to expand employment opportunity for economically disadvantaged individuals" and documented "workforce needs and developed a strategy to meet such workforce needs consistent with the commitments." The CHIPS Act also provides that applicants must demonstrate "an executable plan to sustain the facility" without additional Federal financial assistance and "to identify and mitigate relevant semiconductor

supply chain security risks, such as risks associated with access, availability, confidentiality, integrity, and a lack of geographic diversification in the covered entity's supply chain." The Department is also required to "increase participation of and outreach to economically disadvantaged individuals, minority-owned businesses, veteran-owned businesses, and women-owned businesses."

Ultimately, our application process is rigorous and not driven by any one requirement. Advancing our economic and national security is the primary lens through which we are evaluating applications. First and foremost, we are looking for projects that advance U.S. economic and national security. Among other things, we are looking at whether projects build sustainable domestic capacity that reduces U.S. reliance on vulnerable or overly concentrated production. If an applicant cannot make a case for how its project promotes economic and national security, it will not receive funding. The Department also laid out five additional criteria that it will use to evaluate projects, including a project's commercial viability, an applicant's financial strength, and an applicant's commitment to workforce development. It is vitally important that our funding contributes to the creation of good-paying jobs and long-term, inclusive economic growth. Other criteria we weigh include project technical feasibility and readiness, as well as broader community impacts. This includes assessments of environmental risk and the effects of climate change.

We also want to clarify the characterization of some of the requirements you listed. With respect to the statement that the Department requires that applicants requesting more than $150 million describe their plans to provide "adult care, transportation assistance, housing assistance, and emergency cash assistance," all applicants are asked to note the wraparound services they and their partners will provide to help retain and attract workers. There is not a requirement that companies provide the services described, but rather that the applicant notes what services they plan to provide to increase access to training and employment opportunities. With respect to the statement that the Department is "Requiring applicants to detail how they will hire 'individuals whose ability or opportunity to compete in the economy has been impaired due to. . .racial or ethnic prejudice or cultural bias within American society'," the Department notes that this is one category of "economically disadvantaged individuals." The CHIPS Act text states that "It is the sense of Congress that, in carrying out subsection (a), the Secretary should allocate funds in a manner that—. . . (6) promotes the inclusion of economically disadvantaged individuals and small businesses." To satisfy this element of the legislation, the Department has asked applicants to "develop an equity strategy, in concert with their partners, to create equitable workforce pathways for economically disadvantaged individuals in their region." (NOFO, page 21)

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARSHA BLACKBURN TO HON. GINA M. RAIMONDO

Question 1. Will you commit to working with Secretary Yellen to develop a final rule to implement the section 48D credit with a definition of semiconductor that includes semiconductor-grade polysilicon?

Answer. Commerce and Treasury are coordinating closely on the investment tax credit (ITC) to ensure that incentives are complementary and advance our shared economic and national security goals. The Treasury Department is in the lead of implementing the CHIPS ITC and continues working to publish its final rule.

Question 2. I'm concerned that potential CHIPS Act R&D dollars will go towards projects who associated intellectual property is mainly based overseas. I believe it is essential that companies utilizing U.S. taxpayer dollars should conduct most of their R&D in the U.S.

a. How are you working with applicants to ensure valued R&D and intellectual property is housed and based in the U.S.?

b. What more can Congress do to incentivize U.S.-based R&D?

Answer. The Department takes seriously its obligation to promote U.S. manufacturing, economic competitiveness, and national security goals, including in the execution of its research and development programs. Recent publications have reiterated this commitment to potential applicants for R&D funds. For instance, the November 2023 vision paper for the National Advanced Packaging Manufacturing Program articulated our goal of establishing a "a vibrant, self-sustaining, profitable, high-volume, onshore packaging industry where advanced node chips manufactured in the United States are packaged in the United States." The paper also articulated that accelerating critical innovations in advanced packaging to U.S. manufacturing entities is a program mission.

CHIPS for America, in concert with relevant groups throughout the Department, is reviewing best practices and developing protocols to both protect intellectual property and to encourage domestic production and commercialization.

Within the CHIPS Program Office, which intends to fund R&D facilities, the national security guardrails will help ensure CHIPS investments enhance global supply chain resilience in coordination with allies and partners and will promote U.S. leadership in designing and building important semiconductor technologies. In the final rule, the Department is implementing two national security guardrails: 1) an expansion clawback that limits the expansion of semiconductor manufacturing in foreign countries of concern; and 2) a technology clawback that limits joint research or technology licensing efforts with foreign entities of concern.

The final rule strikes a balance between limiting activities that are inconsistent with the national security goals of the CHIPS Act and the desire not to unduly disrupt the existing semiconductor ecosystem. To prevent circumvention of the Technology Clawback while allowing for greater flexibility in enforcement, the final rule limits direct application of the Technology Clawback to just the covered entity but allows the Department to impose additional conditions on "related entities" of the covered entity with respect to joint research and technology licensing. A related entity is any entity that directly, or indirectly through one or more intermediaries, controls or is controlled by, or is under common control with, the covered entity. We will document these relationships and joint research and technology activities in the agreement with the covered entity. In contrast to the mandatory clawback of the Technology Clawback, Commerce will have flexibility to take appropriate remedial measures, including imposing a mitigation agreement, if the additional conditions are violated.

Question 3. How are you coordinating your activities with the national laboratories? What are the potential areas for collaboration with the national laboratories?

Answer. There are potential areas for collaboration with national laboratories in critical and emerging technologies, such as with AI, biotechnology, quantum information science, and energy technologies. For example, in quantum, activities with national laboratories are overseen by the Department of Energy (DOE), and coordination happens through the National Science and Technology Council Subcommittee on Quantum Information Science (SCQIS) with support by the National Quantum Coordination Office (NQCO). The NQCO carries out the daily activities needed for supporting the National Quantum Initiative; NIST details a researcher to that office. As an example of this coordination, Commerce hosted the SCQIS's annual Quantum Information Science Program Day at the Hoover Building in September 2023. The event is an annual government-only meeting that brings together program managers, researchers, and stakeholders from across the U.S. Government to coordinate and discuss programs, projects, and directions for Quantum Information Science research and development (R&D) across the Federal government.

As a consequence of these coordination activities in quantum, NIST has a number of collaborative projects with researchers at national laboratories, on topics such as advancing quantum computing and its applications, the use of quantum-enhanced sensing for applications in high-energy physics, new approaches to quantum networking, and development of integrated photonics for quantum (a key enabling technology). NIST will also closely coordinate with the Department of Energy on actions in response to President Biden's Executive Order on Safe, Secure, and Trustworthy Development and Use of Artificial Intelligence. This will include developing and ensuring availability of testing environments such as AI model evaluation tools and AI testbeds to support the development of safe, secure, and trustworthy AI technologies. NIST is working with DOE to utilize their advanced compute architecture for testing and evaluating computationally intensive AI algorithms such as large language models (LLMs).

Question 4. I'm concerned that much of the advanced packaging of semiconductors is done in China.

a. How much of this is being done in China?

b. What are you doing to reduce the costs and regulatory barriers of this innovation in the U.S.?

Answer. While China accounts for a notable share of overall packaging of semiconductors—representing approximately 20 percent of chips sold by U.S.-based companies—a small share of this is advanced packaging. Much of the world's advanced packaging is carried out by the three major providers of cutting-edge semiconductor fabrication: Taiwan Semiconductor Manufacturing Company (TSMC), Samsung, and Intel. Most packaging for these companies is carried out outside China, with Intel's advanced packaging facilities located in Malaysia and in the United States, where

it is investing an additional $3.5 billion to expand its Rio Rancho, New Mexico advanced packaging facility.

On November 20, 2023, CHIPS for America released "The Vision for the National Advanced Packaging Manufacturing Program", which outlined its intent to "establish a vibrant, self-sustaining, profitable, high-volume, onshore packaging industry where advanced node chips manufactured in the United States are packaged in the United States." The Vision paper further recognized the need to establish domestic advanced packaging manufacturing capabilities that are cost-effective and efficient. To achieve these goals, CHIPS for America envisions investing in four technology areas—materials and substrates; equipment, tools, and processes; power delivery and thermal management; and photonics and connectors—as well as two ecosystem areas—chiplets and co-design—as well as in a physical piloting facility.

Question 5. Most of the funding for the Public Wireless Supply Chain Innovation Fund has gone to academic institutions. What steps is Commerce specifically taking to support commercial wireless deployment?

Answer. The CHIPS and Science Act funded the Public Wireless Supply Chain Innovation Fund, administered by the National Telecommunications and Information Administration (NTIA). The $1.5 billion Innovation Fund supports the development of open and interoperable wireless networks. This grant program will help drive wireless innovation, foster competition, and strengthen supply chain resilience. It will also help unlock opportunities for innovation and competition in a market historically dominated by a few suppliers, including high-risk suppliers that raise security concerns.

In April 2023, the Department announced its first Notice of Funding Opportunity under the Innovation Fund, making $140.5 million available to demonstrate the viability of new approaches to wireless, such as open radio access networks (Open RAN). The Department received more than 120 applications for the first round of funding. On February 12, 2024, the Department announced the fourth and final round of funding from this first Notice of Funding Opportunity, with an award of $42.3 million. This grant will fund a project by a consortium of U.S. carriers, foreign carriers, universities and equipment suppliers to establish a testing, evaluation, and research and development (R&D) center along with a satellite facility. Previous rounds of funding supported R&D as well as testing and evaluation activities, including grants to U.S. carriers and equipment suppliers that establish new testbeds. These investments will make industry-standard testing more accessible to new market players and encourage greater collaboration within the wireless industry.

NTIA is committed to working with for-profit companies, trade groups, civil society, non-profit corporations, and academia to facilitate the development and deployment of open and interoperable, standards-based telecommunications networks in communities across America, including in rural areas.

We anticipate a second Notice of Funding Opportunity to be issued in Spring 2024.

Question 6. What is the Department of Commerce doing to incentivize research to commercialization of Quantum technologies?

Answer. The Department of Commerce incentivizes research to commercialization of Quantum technologies by supporting research that continues to advance both the technologies and fundamental science needed to expand quantum applications; by supporting the quantum ecosystem through engagement with quantum institutes such as the Quantum Economic Development Consortium (QED–C) and its 170+ corporate participants; through Cooperative Research and Development Agreements (CRADAs) with individual companies to help them with particular technical challenges; and by supporting workforce development activities, such as those at NIST joint institutes: Joint Quantum Institute, Joint Center for Quantum Information and Computer Science, and JILA. NIST also partners with several National Science Foundation (NSF) and DOE national quantum centers, such as NSF's Quantum Systems through Entangled Science and Engineering (Q–SEnSE) and DOE's Quantum Systems Accelerator (QSA). These Centers include activities for transitioning research to industry, such as engineering partnerships to enable field deployment of technologies. As an indicator of Department of Commerce success in incentivizing quantum research to commercialization, a wide range of NIST quantum technologies is now being commercialized. For example, in quantum computing, NIST superconducting circuits, microfabricated ion traps, optical tweezer arrays, and single-photon technologies are now being used in state-of-the-art quantum information processor chips. This tech transfer is the result of decades of world-leading basic quantum information science at NIST and is being sustained by a robust flow of NIST research associates (students and postdocs) to quantum companies.

On October 23, 2023, the Economic Development Administration (EDA) announced the winners of Tech Hubs Phase 1 and posted the Notice of Funding Opportunity for Phase 2. This announcement included 31 designated Tech Hubs across 32 states and Puerto Rico, as well as the 29 consortia that will receive Strategy Development Grants. The 31 Tech Hubs focus on developing and growing innovative industries in regions across the country, including semiconductors, clean energy, critical minerals, biotechnology, precision medicine, artificial intelligence, quantum computing, and more. Two designated Tech Hubs, Elevate Quantum Colorado and Chicago's The Bloch Tech Hub, will primarily focus their regional technology-centric development strategies on the advancement of quantum technologies.

Question 7. How are you evaluating potential applicants' contribution to keep the U.S. in a leadership position in semiconductor technology? For instance, how are you weighing a company who performs and keeps its R&D and intellectual property here in the U.S. versus others?

Answer. The evaluation criteria for each funding opportunity will reflect relevant policies and best practices—including those already in effect at agencies with a similar mandate—to improve U.S. economic and national security, as well as relevant policies used to award CHIPS Incentives. The evaluation criteria will also incorporate relevant policies and best practices from previous NIST funding opportunities, such as technical merit and innovativeness of the proposed work.

Question 8. Can you tell me how you will prioritize the importance of actual commercialization and time-to-market at the new Manufacturing USA Institutes?

Answer. Manufacturing USA institutes bridge the gap from discovery to production and help ensure that U.S. inventions get out of the labs and are translated into products that are manufactured in the United States. Seventeen institutes make up the Manufacturing USA National Network, on technologies such as additive manufacturing (America Makes) and biomanufacturing (NIIMBL). In 2022, the Institutes worked with more than 2,500 member organizations, collaborated on over 650 R&D projects, and engaged over 100,000 people in workforce development. All Manufacturing USA institutes accelerate time to market for innovation needed for industrial competitiveness, including through a focus on Education and Workforce Development to ensure that there are skilled workers to deploy the technology and benefit from well-compensated advanced manufacturing jobs.

CHIPS Manufacturing USA Institute Objectives—CHIPS R&D expects that the NOFO soliciting proposals will seek to achieve the following objectives:

1. Significantly reduce U.S. chip development and manufacturing costs, such as by improving capacity planning, optimizing production, and enabling real-time process adjustments.
2. Improve development cycle time and accelerate adoption of innovative semiconductor manufacturing technologies, including breakthrough tools, manufacturing equipment, materials, and manufacturing processes validated at the shared facility.
3. Advance digital twin-enabled curricula and best practices for training the semiconductor workforce nationwide.
4. Create a digital twin marketplace for industry, including entrepreneurs, to access digital models and manufacturing process flows and to de-risk digital twin development and implementation.

CHIPS R&D expects to solicit proposals demonstrating strong industry leadership capable of catalyzing collaboration in software development relevant to digital twins (including but not limited to electronic design automation tools), semiconductor manufacturing, advanced packaging, and assembly. Expected activities include establishing a shared physical facility where companies can experiment while protecting proprietary information; enabling industry-relevant research projects; leveraging a shared marketplace that enables data aggregation across companies, while protecting proprietary data, to make powerful digital twins available at low cost; and operating an education and workforce development program, which may include partnerships with educational institutions.

Question 9. Please give me an update on the National Manufacturing Extension Partnership (MEP) Supply Chain Database Act.

Answer. The CHIPS and Science Act directs NIST to establish a voluntary National Supply Chain Database. This directive did not include any appropriations. The Manufacturing Extension Partnership (MEP) Network has Centers in all 50 states and in Puerto Rico. Each Center is a partnership between the Federal government and a variety of public or private entities, including state, university, and nonprofit organizations. Over the last several years, the MEP National Network has ac-

tively engaged with the manufacturing industry, resulting in over 54,000 completed projects with more than 23,000 different manufacturing clients, leading to $47.6 billion in sales (new and retained), $7.2B billion in cost savings, $16.8 billion in new client investments, and in turn, helped create or retain more than 346,000 jobs.

With the enacted funding in Fiscal Year (FY) 2023, MEP invested $20.4 million in its Centers across the country to initiate the Supply Chain Optimization and Intelligence Network (SCOIN) and identify vulnerabilities and gaps in the current manufacturing ecosystem as part of the MEP Expansion Awards Pilot Program (MEAPP). The SCOIN has enabled the MEP National Network to employ over 60 supply chain experts across the country, to focus on mapping and assessing manufacturers in aerospace; defense; biomanufacturing; and clean energy sectors. The MEP National Network Supplier Scouting service has received 130 requests to find an American supplier of a product or technology needed in a domestic supply chain. To date, 40 unique manufacturing companies have been identified as exact matches for the requestors.

Question 10. What can we do to expedite regulatory approval and reviews for businesses engaged in the semiconductors supply chain? Its my understanding South Korea does this well.

Answer. The Commerce Department's CHIPS Program Office's second Notice of Funding Opportunity (NOFO), released September 29, 2023, seeks applications for smaller-scale projects involving the construction, expansion, or modernization of semiconductor materials and manufacturing equipment facilities for which the capital investment falls below $300 million. These applicants play a vital role in producing the inputs necessary for producing semiconductors in the United States, support our domestic manufacturing ecosystem, and create jobs and opportunities in communities across the country. These projects will produce the equipment, chemicals, gases, and other materials that are critical to manufacturing semiconductors in America. The Department seeks to move as fast as possible, is asking for concept plans by February 1, 2024, and then will move quickly to select applicants for the full application phase. The timeline of funds going out the door will ultimately depend on the strength of applications and projects, but we need to get this done right because it is a national security imperative to the United States. We understand we are asking for a lot of information, and the information we are requesting is essential to our ability to get these applications processed efficiently.

Question 11. In 2022, OSTP published a Draft National Strategy on Microelectronics Research. The national laboratories responded to the draft strategy to address potential gaps, but haven't seen a final version of the strategy. Do you know the status of the final version of this plan and whether the strategy is informing execution of the CHIPS act?

Answer. The OSTP Subcommittee for Microelectronics Leadership (SML), which released the draft National Strategy on Microelectronics Research along with a Request for Information (RFI), consists of representatives from all departments and agencies with responsibilities under the CHIPS Act.

The SML has made further progress since publication of the draft. For instance, SML carefully reviewed the extensive RFI feedback and presented the draft strategy to the Industrial Advisory Committee (IAC). SML then incorporated feedback from the RFI and the IAC. The interagency is currently finalizing the document based on these inputs and on a formal interagency review and clearance process. The active participation and engagement by representatives from multiple departments and agencies in strategy development and their continued collaboration in strategy review and implementation will inform execution of the individual CHIPS Act provisions, helping ensure the full leveraging of individual agency efforts.

Question 12. Please tell me how you will prioritize EDA Tech Hub partnerships to produce faster routes from research to actual commercialization?

Answer. On October 23, 2023, the Department of Commerce's Economic Development Administration announced the designation of 31 Tech Hubs in regions across the country. This economic development initiative is designed to drive regional innovation and create jobs by strengthening a region's capacity to manufacture, commercialize, and deploy technology.

The Tech Hubs program will help develop and grow innovative industries in diverse regions of the country in industries ranging from semiconductors to clean energy, critical minerals, biotechnology, artificial intelligence, and more. Tech Hubs will bring the benefits and opportunities of scientific and technological innovation to communities across the country, with nearly one-quarter located in small or rural areas and more than three-fourths directly supporting historically underserved communities. Tech Hubs consortia bring together private industry, state and local governments, institutions of higher education, labor unions, Tribal communities, non-

profits, and more to compete for approximately $40–70 million in Phase 2 implementation grants to further develop these fields and make transformative investments in innovative industries.

The 31 designated Tech Hubs, located across 32 states and Puerto Rico, will leverage existing talent, resources, and assets to mature critical and emerging technology sectors, while advancing equitable growth. Of the Designated Tech Hubs, 14 include states that have historically received lower levels of Federal research dollars.

In Phase 1, a critical application evaluation criterion was the potential for a region to achieve global competitiveness in its selected technology focus area over the next decade. EDA evaluated innovation assets, market opportunity, and the region's capacity to commercialize emerging technologies. In Phase 2, EDA will evaluate proposed projects' ability to deliver on that technology-based potential to achieve global competitiveness. Additionally, EDA has and will continue to work across the Department of Commerce and Federal agencies, such as the U.S. Patent and Trademark Office, to identify Federal resources to support Tech Hubs' regional and technology development and commercialization.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. TODD YOUNG TO HON. GINA M. RAIMONDO

The CHIPS Program Office has indicated that it will outline funding opportunities for "commercial" R&D facilities later this year. The statute defines covered entities eligible for 9902 funds to include nonprofit entities but there is no statutory limitation on 9902 funds to commercial research facilities. In Indiana, Purdue University is pursuing an expansion of its research facilities and bringing world-leading semiconductor research institutions such as IMEC to the area, and I want to ensure 9902 funds are available to them, consistent with the statute.

Question 1. Can you confirm that the Department will open an opportunity for nonprofit and non-commercial research facilities to apply for 9902 incentive funds, in addition to 9906 funds, consistent with the statute?

Question 2. When is such an opportunity expected to open?

Answer. As with past funding opportunities, the CHIPS Program Office is developing its funding opportunity for R&D facilities consistent with the statute and the program's economic and national security objectives. We expect to release this funding opportunity in the months ahead.

Huawei recently unveiled a new smartphone with a chip that some have said is unlikely to have been possible to be produced without U.S. technology.

Question 1. Are you concerned about the possibility that Huawei used U.S. technology to produce a chip for their new smartphone?

Question 2. I've heard you say before that it's the Biden Administration's policy that no further licenses for chip sales were to be granted to Huawei, but do older licenses still exist?

Question 3. If so, are you concerned about existing licenses?

Answer. Placing foreign companies on the Entity List allows the U.S. government to control their access to U.S. technology, including commercial products. The Entity List is not an embargo—it is a regulatory tool to assess export transactions involving parties that have been added to the Entity List for various reasons. The policy for reviewing license applications for each party is public and determined by the Departments of Commerce, Defense, State, and Energy based on national security and foreign policy considerations.

Since 2019, Huawei Technologies Co., Ltd. (Huawei) and many of its affiliates have been on the Commerce Department's Entity List and are subject to the Foreign-Produced Direct Product Rule (Foreign Direct Product, or FDP, Rule), which imposes a license requirement on the export to Huawei of any foreign-produced items that are the direct product of certain U.S. technology or software or produced by any plant or major component of a plant that is located outside the United States. The licensing policy outlined in Huawei's Entity Listing provides for case-by-case review of applications for the export of items that support technologies below the 5G-level, and a presumption of denial for all other items subject to the EAR. Any license applications approved for exports to Huawei since 2019 were approved according to these guidelines based on the national security assessments, and concurrence, of Commerce as well as our interagency partners. As Under Secretary Estevez has testified before Congress, Bureau of Industry and Security (BIS) is engaging in an ongoing assessment of BIS's export control policies related to the PRC and calibrating them based on the evolving dynamics of the threat environ-

ment. BIS has made a number of changes in the past year to respond to national security concerns presented by the PRC, including the imposition of new controls on advanced semiconductor manufacturing equipment and related items, controls on software and components for the production of advanced semiconductors, and others.

Huawei remains on the Entity List and no changes to its licensing policy have been made at this time. However, we continue to assess, as noted above, all policies related to exports to the PRC, and Huawei licensing is included in that review.

With respect to reports regarding the new Huawei phone, the Department cannot comment on any law enforcement matters, but allegations of violations of our export licensing rules are investigated diligently and enforced appropriately. The Department of Commerce is working to obtain more information on the character and composition of the purported 7 nanometer chip in the Huawei smartphone. The restrictions in place since 2019 knocked Huawei down and forced it to reinvent itself—at a substantial cost to the company and Chinese government. The Department is continually working to assess and, when appropriate, update our controls based on the dynamic threat environment and we will not hesitate to take appropriate action to protect U.S. national security—as we did with the rules issued on October 7, 2022, which applied China-wide restrictions on high-end chips, semiconductor manufacturing equipment, and other items, and updated and strengthened on October 17, 2023. These controls apply PRC-wide, and apply to Huawei.

More specifically, the October 7, 2022 advanced computing and semiconductor equipment rule issued by BIS imposed restrictions on the PRC's access to certain advanced semiconductor manufacturing equipment, chips and other items needed to develop AI and prohibited U.S. persons from supporting chip development and production that power AI systems at certain semiconductor fabrication facilities located in the PRC or Macau without a license.

On October 17, 2023, BIS released a package of rules designed to update export controls on advanced computing semiconductors and semiconductor manufacturing equipment, as well as items that support supercomputing applications and end-uses, to arms embargoed countries, including the PRC, and to place additional Chinese entities on the Entity List. These rules reinforce the October 7, 2022, controls to restrict the PRC's ability to both purchase and manufacture certain high-end chips critical for military advantage.

The Advanced Computing Chips Interim Final Rule retains the stringent PRC-wide licensing requirements imposed in the October 7, 2022, rule and makes two categories of updates by: 1) adjusting the parameters that determine whether an advanced computing chip is restricted; and 2) imposing new measures to address risks of circumvention of the controls.

The Expansion of Export Controls on Semiconductor Manufacturing Items Interim Final Rule: 1) imposes controls on additional types of semiconductor manufacturing equipment; 2) refines and better focuses the U.S. persons restrictions while codifying previously existing agency guidance, to ensure U.S. companies cannot provide support to advanced PRC semiconductor manufacturing while avoiding unintended impacts; and 3) expands license requirements for semiconductor manufacturing equipment to apply to additional countries beyond the PRC and Macau, to 21 other countries for which the U.S. maintains an arms embargo.

Restrictions on the highest end semiconductors and manufacturing equipment on a China-wide basis, and restrictions on a host of PRC supercomputing, AI chip development, tool manufacturers and others have further restricted not just Huawei's ability to obtain these items, but firms throughout the PRC semiconductor ecosystem. The Department of Commerce is working to obtain more information on the character and composition of the purported 7 nanometer chip in the Huawei smartphone.

Export controls are just one tool in the U.S. government's toolbox to address the national security threats presented by the People's Republic of China (PRC). The restrictions on Huawei in place since 2019 have impaired Huawei and forced it to reinvent itself—at a substantial cost to the PRC government.

On September 26 and 27, the NIST R&D Office held its first summit to further semiconductor industry standards development.

Question 1. How is the Department of Commerce getting small businesses involved in standards development and alleviating any concerns about IP and data sharing?

Question 2. Will CHIPS R&D dollars go to improve data transparency and trackability?

Answer. The Standards Summit was the first step in the CHIPS R&D strategy to enable industry leadership in standards development. More than 330 companies

participated in the Summit, including a broad spectrum of small businesses and startups.

The next step is a standards workshop series focused on standards priorities identified in the Standards Summit. These hybrid workshops are open to all and provide opportunities for experts from academia and industry, including small businesses, to provide direct input into technical foundations for standards needed by industry. The first two workshops took place the week of December 11, 2023, and focused on chiplets interfaces and digital twin for semiconductor manufacturing and supply chain assurance. More than 500 people registered for these workshops, including representatives from a broad range of small and medium enterprises. This continuing workshop series provides an easily accessible venue for small businesses nationwide to introduce their ideas and interests and guide CHIPS R&D standards development processes. Within this workshop series, we expect to cover approaches to managing IP while enabling appropriate data sharing.

Participants in the CHIPS R&D Standards Summit identified establishing data-sharing standards—which can foster collaboration, enhance product consistency, protect equipment, and ensure high-quality manufacturing outputs—as a top priority area. They further recommended that CHIPS for America help define standardized data sharing taxonomies and explore data types that can be shared without compromising company equities. CHIPS for America will explore the potential for establishing this as a topic of one of its upcoming technical standards workshops.

One of the key provisions of the CHIPS and Science Act is the Regional Technology and Innovation Hubs program.

Question 1. Can you assure me that, given limited resources currently, existing implementation dollars available for Phase Two of the Tech Hubs application process will be spread equitably across EDA regions?

Answer. On October 23, 2023, the Department of Commerce's Economic Development Administration (EDA), announced the designation of 31 Tech Hubs in regions across the country. This economic development initiative is designed to drive regional innovation and create jobs by strengthening a region's capacity to manufacture, commercialize, and deploy technologies that support economic and national security.

The Tech Hubs program will help develop and grow innovative industries in all regions of the country in industries ranging from semiconductors to clean energy, critical minerals, biotechnology, artificial intelligence, and more. Tech Hubs will bring the benefits and opportunities of scientific and technological innovation to communities across the country, with nearly one-quarter located in small or rural areas and more than three-fourths directly supporting historically underserved communities. They bring together private industry, state and local governments, institutions of higher education, labor unions, Tribal communities, nonprofits, and more to compete for approximately $40–70 million in implementation grants to further develop these fields and make transformative investments in innovative industries. The 31 designated Tech Hubs, located across 32 states and Puerto Rico, will leverage existing talent, resources, and assets to mature critical and emerging technology sectors, while advancing equitable growth.

Geographic diversity is an explicit objective of the Tech Hubs Program. By statute, there are certain geographic requirements for Phase 1 awards, including the requirements that at least three designated Tech Hubs in each EDA region, at least one third of designated Tech Hubs significantly benefit small and rural communities, along with required geographic distribution of Strategy Development Grants. Tech Hubs considered and met these requirements and the explicit geographic diversity intent of the program in its merit review of Phase 1 applications.

While there are no statutory requirements for the geographic distribution of Phase 2 Implementation Grants, geographic diversity will be among our priorities in the execution of Phase 2.

Ensuring U.S. artificial intelligence leadership depends on our ability to bring advanced packaging onshore and advanced packaging has been identified as a critical area of need for a healthy semiconductor ecosystem.

Question 1. What types of applicants best meet our advanced packaging needs?

Question 2. Since there is virtually no packaging done in the U.S., do you feel confident in our ability to onshore these technologies?

Answer. The National Advanced Packaging Manufacturing Program (NAPMP) will establish programs that ensure the U.S. is a global leader in advanced packaging, assembly, and testing. The program will provide strategic support to grow key technology areas such as chiplets and heterogeneous integration through indus-

try partnerships, advanced pilot facilities, and workforce training and development, to realize U.S. based manufacturing.

On November 20, 2023, CHIPS for America released "The Vision for the National Advanced Packaging Manufacturing Program," which outlined its intent to "establish a vibrant, self-sustaining, profitable, high-volume, onshore packaging industry where advanced node chips manufactured in the United States are packaged in the United States." To achieve this goal, CHIPS for America envisions investing in four technology areas—materials and substrates; equipment, tools, and processes; power delivery and thermal management; and photonics and connectors—as well as two ecosystem areas—chiplets and co-design—as well as in a physical piloting facility. As explained in the paper, NAPMP aims to leverage existing areas of U.S. strength, including in semiconductor design, manufacturing equipment, and R&D expertise.

CHIPS for America will publish evaluation criteria in individual NAPMP funding opportunities.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. SHELLEY MOORE CAPITO TO HON. GINA M. RAIMONDO

Supply Chain

America can never be replaced as the global economic and innovation leader which is why I was proud to support the CHIPS and Science Act because winning the future means making the necessary investments to address issues like the microchip shortage, prepare the next generation of workers in science and technology fields, and keep up with our competitors.

Question 1. While implementing regulations, will you make sure the full supply chain is supported? More specifically, can you commit to saying that taxpayer-funded semiconductor plants won't use Chinese materials or packaging, and can't be shut down by Chinese coercion?

Answer. The national security guardrails will help ensure CHIPS investments enhance global supply chain resilience in coordination with allies and partners and will promote U.S. leadership in designing and building important semiconductor technologies. In the final rule, the Department is implementing two national security guardrails: 1) an expansion clawback that limits the expansion of semiconductor manufacturing in foreign countries of concern; and 2) a technology clawback that limits joint research or technology licensing efforts with foreign entities of concern. The guardrails cover investments in wafer fabrication, front-end semiconductor fabrication and packaging facilities, but do not apply to toolmaking facilities or facilities producing materials for semiconductor production. The guardrails prohibit most expansion of existing facilities in foreign countries of concern. In recognition that some potential applicants for CHIPS Incentives may have existing facilities in foreign countries of concern, and to minimize potential supply chain disruptions, the CHIPS Act allows for certain transactions involving mature (legacy) semiconductor manufacturing in a foreign country of concern. The guardrails set limits on any expansion of legacy or advanced facilities. The guardrails limit the expansion of legacy facilities to ten percent. Advanced facilities can expand by no more than five percent. The final rule ties expanded semiconductor manufacturing to the addition of cleanroom or other physical space or production lines that result in expanding the facility's production capacity by the applicable percentage. These thresholds are intended to capture most transactions attempting to expand manufacturing capacity, yet still allow for ordinary course-of-business tool replacements and upgrades. The final rule strikes a balance between limiting activities that are inconsistent with the national security goals of the CHIPS Act and the desire not to unduly disrupt the existing semiconductor ecosystem.

Further the CHIPS Incentives program released a second NOFO on September 29th focused squarely on the upstream semiconductor manufacturing supply chain for equipment and materials. This designates $500 million to support projects with capital expenditures under $300 million, that onshore and produce the critical inputs to U.S. semiconductor fabs. That program was open for concept plan submissions from December 1, 2023, through February 1, 2024 and received over 160 small supplier concept plans. Our strategy is to align the projects we see to global commodity risks in order to close as many gaps as possible in the domestic supply chain.

West Virginia Tech Hub

The Phase 1 applications I have seen submitted for a West Virginia Tech Hub are extremely well aligned with the intent of the program. A West Virginia Tech Hub would facilitate investment in a diverse geographic locality, to unlock industrial technological development in new places, as was intended by law. The program re-

quires that at least one-third of Tech Hub grants and designations must "significantly benefit a small and rural community".

Question 1. Does this mean that every one of three Hub designations under Phase 2 will be awarded to rural communities?

Question 2. Can the Department specify in the Phase 2 NOFO that another portion of Phase 2 designations be awarded to a rural state?

Answer. On October 23, 2023, the Department of Commerce's Economic Development Administration (EDA), announced the designation of 31 Tech Hubs in regions across the country. This economic development initiative is designed to drive regional innovation and create jobs by strengthening a region's capacity to manufacture, commercialize, and deploy technology.

The Tech Hubs program will help develop and grow innovative industries in all regions of the country in industries ranging from semiconductors to clean energy, critical minerals, biotechnology, artificial intelligence, and more. Tech Hubs will bring the benefits and opportunities of scientific and technological innovation to communities across the country, with nearly one-quarter located in small or rural areas and more than three-fourths directly supporting historically underserved communities. They bring together private industry, state and local governments, institutions of higher education, labor unions, Tribal communities, nonprofits, and more to compete for approximately $40–70 million in implementation grants to further develop these fields and make transformative investments in innovative industries. The 31 designated Tech Hubs, located across 32 states and Puerto Rico, will leverage existing talent, resources, and assets to mature critical and emerging technology sectors, while advancing equitable growth.

Geographic diversity is an explicit objective of the Tech Hubs Program. By statute, there are certain geographic requirements that EDA adhered to in their Phase 1 awards, including requirements that at least three designated Tech Hubs are in each EDA region, at least one third of designated Tech Hubs significantly benefit small and rural communities, along with required geographic distribution of Strategy Development Grants. Tech Hubs considered these requirements and the explicit geographic diversity intent of the program in its merit review of Phase 1 applications. In fact, EDA also awarded six Strategy Development Grants (SDG) to Appalachian entities, including two from West Virginia, to help communities significantly increase local coordination and planning activities. Such development could make selected grantees more competitive for future Tech Hubs funding opportunities.

While there are no statutory requirements for the geographic distribution of Phase 2 Implementation Grants, fostering inclusive technology-based economic development across diverse U.S. geographies diversity is among EDA's priorities in its implementation of Phase 2.

BEAD

I believe my state has been doing a great job so far working on its initial proposal for the BEAD program, but one sticking point has been related to the financial requirements for providers such as a line of credit. I share the concern of having untested providers be part of BEAD since I saw how much the BTOP money was wasted back in 2010, but I have heard that these financial constraints are difficult even for larger proven providers to meet.

I know that at least one other state is requesting some flexibilities as it relates to the financial requirements.

Question 1. Are you and NTIA open to considering some financial requirement flexibilities for providers such as performance bonds or less capital-intensive means?

Answer. As the National Telecommunications and Information Administration (NTIA) administers the BEAD Program, we are committed to being good stewards of taxpayer dollars. That means making sure BEAD Program subgrantees can see their deployment projects through—not just to the end of construction, but on an ongoing basis as service providers deliver affordable, reliable high-speed Internet service. To that end, the NOFO required prospective subgrantees to provide an irrevocable standby letter of credit to the Eligible Entity (*i.e.,* the 50 states, five territories, and the District of Columbia) before entering into a subgrantee agreement. The amount of the letter of credit must be no less than 25 percent of the subaward amount.[25] The NOFO also invited Eligible Entities to propose alternatives "if they are necessary and sufficient to ensure that the Program's objectives are met."[26]

[25] BEAD NOFO at 72, 73.
[26] *Id.* at 71.

On November 1, 2023, NTIA published a conditional programmatic waiver that modifies the letter of credit requirement for subgrantees of all Eligible Entities in the following ways:

- *Allow Credit Unions to Issue letters of credit.* The NOFO requires subgrantees to obtain a letter of credit from a U.S. bank with a safety rating issued by Weiss of B– or better. The waiver permits subgrantees to fulfill the letter of credit Requirement (or any alternative permitted under the waiver) utilizing any United States credit union that is insured by the National Credit Union Administration and that has a credit union safety rating issued by Weiss of B– or better.
- *Allow Use of Performance Bonds.* The waiver permits a subgrantee to provide a performance bond equal to 100 percent of the BEAD subaward amount in lieu of a letter of credit, provided that the bond is issued by a company holding a certificate of authority as an acceptable surety on Federal bonds as identified in the Department of Treasury Circular 570.
- *Allow Eligible Entities to Reduce the Obligation Upon Completion of Milestones.* The waiver allows an Eligible Entity to reduce the amount of the letter of credit obligation below 25 percent over time, or reduce the amount of the performance bond below 100 percent over time, upon a subgrantee meeting deployment milestones specified by the Eligible Entity.
- *Allow for an Alternative Initial letter of credit or Performance Bond Percentage.* The NOFO requires that the initial amount of the letter of credit be 25 percent of the subaward (or the initial amount of the performance bond be 100 percent of the subaward under the option described above). The waiver allows the initial amount of the letter of credit or performance bond to be 10 percent of the subaward amount during the entire period of performance when an Eligible Entity issues funding on a reimbursable basis consistent with Section IV.C.1.b of the NOFO and reimbursement is for periods of no more than six months each.

By providing an expanded universe of potential issuers of letters of credit and specific, permissible alternatives to the letter of credit requirement, NTIA remains faithful to our objectives of encouraging robust participation from a broad range of service providers while giving states and territories more ways to ensure that grant recipients can build a high-quality network and operate it for years to come.

BEAD High-Cost Threshold

One concern I have with the BEAD program's NOFO deals with the difficulty to get fiber-optic cable to every place in my state. I know that is the best and most reliable broadband connection, but it is not always practical and I wonder about the standards that will be decided between states and NTIA to determine the "extremely high-cost threshold" for when other technologies can be used.

Question 1. How do you view this threshold and do you expect to accommodate extremely different thresholds among neighboring and similar states?

Answer. There is no "one-size-fits-all" approach to broadband deployment given each Eligible Entity's unique challenges, and NTIA will ensure that the Eligible Entities have flexibility in identifying the technical solutions that meet the needs of their communities. In many cases, the best solution will be building out high-speed Internet using fiber networks.

The NOFO recognizes the unique characteristics of fiber to "ensure that the network built by the project can easily scale speeds over time to . . . meet the evolving connectivity needs of households and businesses" and "support the deployment of 5G, successor wireless technologies, and other advanced services."[27]

The NOFO creates room for all strategies and we expect Eligible Entities will use a mix of technologies to connect their unserved and underserved locations. The NOFO allows applicants to propose to provide service over any form of reliable broadband service, including terrestrial fixed wireless over licensed spectrum in certain circumstances. Further, Eligible Entities each have the authority to decline to select a Priority Broadband Project proposal "that requires a BEAD subsidy that exceeds the Extremely High Cost Per Location Threshold for any location to be served in the proposal if use of an alternative Reliable Broadband Service technology meeting the BEAD Program's technical requirements would be less expensive."[28] It also permits funding of satellite and unlicensed wireless service for those locations if there is no other proposal from a provider of Reliable Broadband Service.

With respect to the Extremely High Cost Per Location Threshold, the NOFO states, and NTIA will require, that each Eligible Entity must establish its Ex-

[27] IIJA at § 60102(a)(2)(I).
[28] BEAD NOFO at 38.

tremely High Cost Per Location Threshold in a manner that maximizes use of the best available technology while ensuring that the program can meet the prioritization and scoring requirements set forth in Section IV.B.6 of the NOFO. We look forward to working with each Eligible Entity to help develop an appropriate Extremely High Cost Per Location Threshold.

BEAD Initial Proposals

BEAD Initial Proposals are due by the end of this year. Just like with mapping some states have done better than others. I know my state Office of Broadband has done a fantastic job so far, but I wonder what will happen if some states submit incomplete proposals.

Question 1. Are you concerned about some states leaving certain requirements in the initial proposal blank or requesting flexibilities with some of the requirements that could slow the process down?

Answer. NTIA will not approve an Eligible Entities' plan if it does not meet all requirements of the NOFO and the underlying statute. To ensure the success of the program, NTIA conducted thorough and individualized technical assistance to all Eligible Entities ahead of the December 27, 2023 deadline for Initial Proposal submission. NTIA technical assistance staff have worked intensively with every state and territory government to ensure its plan is both strong and complaint.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. CYNTHIA LUMMIS TO HON. GINA M. RAIMONDO

Question 1. In July 2023, the Department of Commerce and Department of Defense signed a Memorandum of Agreement to strengthen U.S. defense industrial base. In addition to this, what is the Department of Commerce doing to coordinate with activities at the Department of Energy and throughout the Federal government to ensure a robust domestic supply of semiconductor minerals and materials, such as copper, germanium, tellurium, gallium, nickel, cobalt, and others?

Answer. Recognizing the national security imperative of investments in the domestic semiconductor industry, the Departments of Commerce and Defense in July 2023 announced a Memorandum of Agreement (MOA) to expand collaboration to strengthen the U.S. semiconductor defense industrial base. The agreement will increase information-sharing between the Departments to facilitate close coordination on the CHIPS for America's incentives programs, including collaboration on potential investment applications to ensure that our departments are making complementary decisions that maximize Federal investments under the CHIPS Incentive Program and the Department of Defense's (DoD) Defense Production Act and Industrial Base Analysis and Sustainment funds. This alignment of priorities and decision-making will help ensure that our respective investments position the U.S. to produce semiconductor chips essential to national security and defense programs.

The Department is in regular communication with Department of Energy officials about how best to promote more resilient supply chains, especially regarding how the various funding programs can be complementary and not duplicative.

Question 2. In June 2023, the Department of Commerce announced funding opportunities for commercial facilities in the United States for materials used to manufacture semiconductors and semiconductor manufacturing equipment, provided that the capital investment equals or exceeds $300 million to reduce chokepoint risks flowing from the geographic concentration of critical semiconductor inputs, among other objectives.

a. Would domestic mine projects that produce, smelt, and refine minerals and materials for semiconductors be eligible for this funding opportunity?

Answer. Supply chain resilience for raw minerals in the semiconductor supply chain is a long-term challenge that will require partnership with other agencies as well as industry. CHIPS for America is also implementing partnerships for supply chain transparency, risk sharing, and resiliency initiatives with the companies, clusters, and industry groups across the semi supply chain. Projects such as the ones mentioned above may be eligible.

In February 2023, CHIPS for America launched our first Notice of Funding Opportunity (NOFO) for CHIPS funds under the section 9902 Incentives Program, focused on commercial manufacturing facilities. In June 2023, the Department opened our existing funding opportunity and application process for large semiconductor supply projects that include material and equipment facility projects with capital investments equal to or exceeding $300 million.

Question 3. What actions is the Department of Commerce undertaking to ensure the production of domestic minerals and materials essential for semiconductor manufacturing? The U.S. currently depends on foreign sources for most of our supply of these minerals, including those from non-allied nations, including copper, germanium, tellurium, gallium, nickel, and cobalt.

Answer. The Department is in regular communication with Department of Energy officials about how best to promote more resilient supply chains, especially regarding how the various funding programs can be complementary and not duplicative.

The raw mineral sourcing challenges will have to be addressed in concert across agencies as well as with allied countries. U.S. supplies of critical minerals and refining capacity should be strengthened to meet the demands of the semiconductor, battery, and broader electronics industries going forward. Currently CHIPS for America is working with other agencies to voice the demand signal for mineral and chemical capacity as well as enlisting private enterprises further downstream to illustrate and map the entire value chain.

To advance the strategic priorities of CHIPS for America, in June 2023, the Department added bigger supply chain projects to the initial Notice of Funding Opportunity (NOFO) issued in February of that year. This will help position large chipmaking facilities to access the materials, supplies, and equipment they need to make the United States home to manufacturing clusters.

Recognizing the national security imperative of investments in the domestic semiconductor industry, the Departments of Commerce and Defense in July 2023 announced a Memorandum of Agreement (MOA) to expand collaboration to strengthen the U.S. semiconductor defense industrial base. The agreement will increase information-sharing between the Departments to facilitate close coordination on the CHIPS for America's incentives programs, including collaboration on potential investment applications to ensure that our departments are making complementary decisions that maximize Federal investments under the CHIPS Incentive Program and the Department of Defense's (DoD) Defense Production Act and Industrial Base Analysis and Sustainment funds. This alignment of priorities and decision-making will help ensure that our respective investments position the United States to produce semiconductor chips essential to national security and defense programs.

To outcompete the People's Republic of China (PRC), we need bold domestic investments and innovation ecosystems that bring manufacturing in critical technologies and industries back to the United States. Without manufacturing strength in the United States and the innovation that flows from it, we risk falling behind China in the race to invent and commercialize future generations of technology. Diverse, resilient, and sustainable supply chains are critical for national security and economic competitiveness, and a key element of this effort is revitalizing domestic manufacturing, reducing our reliance on the PRC, and positioning ourselves to be proactive instead of reactive.

The Inflation Reduction Act (IRA) is a major achievement for clean energy, energy security, and climate ambition, representing the largest investment in climate and clean energy solutions in U.S. history. This law makes a historic investment in climate and clean energy solutions, delivered through a combination of innovative tax incentives, grant programs, and loan guarantees. The clean energy investment and production provisions in the IRA will incentivize investments across the clean energy supply chain including solar, wind, geothermal, hydrogen, critical minerals and battery technologies, tidal and wave energy, carbon capture and sequestration, and civil nuclear, among many others. In particular, the IRA's section 45X Advanced Manufacturing Production credit incentivizes domestic production of battery components and critical minerals.

The Economic Development Administration's Regional Technology and Innovation Hubs (Tech Hubs) program is working to create regional innovation centers across the country by bringing together industry, higher education institutions, state and local governments, economic development organizations, and labor and workforce partners to supercharge ecosystems of innovation for technologies that are essential to our national security and economic competitiveness. The Tech Hubs program is a key part of President Biden's Investing in America agenda, stimulating private sector investment, creating good-paying jobs, revitalizing American manufacturing, and ensuring no community is left behind by America's economic progress.

Through the Tech Hubs program, the Department is committed to strengthening economic and national security by advancing the capacities of regions to manufacture, commercialize, and deploy these technologies, guided by the following priorities: 1) making more U.S. regions strong competitors in the global innovation economy; 2) building strong communities that share in the prosperity technological innovations bring; 3) spurring the creation of new good jobs and other opportunities for workers at all skill levels; and 4) strengthening and increasing the resilience of the

supply chains that our innovative technology-centric industries rely on to stay secure and competitive.

On October 23, 2023, EDA announced the winners of Phase 1 and posted the Notice of Funding Opportunity for Phase 2. This announcement included 31 designated Tech Hubs, as well as the applications that will receive strategy development grants. The 31 Tech Hubs focus on developing and growing innovative industries in regions across the country, including semiconductors, clean energy, critical minerals, biotechnology, precision medicine, artificial intelligence, quantum computing, and more.

Analyzing critical supply chains to identify potential vulnerabilities before they become crises—going from reactive to proactive—should be prioritized. After receiving an initial $10.8 million appropriation in FY 2023, the Commerce Department's Industry and Analysis (I&A) unit in the International Trade Administration launched the U.S. Government's first Supply Chain Center to serve as the analytic engine for supply chain resilience policy action within the U.S. Government. The FY 2024 Budget Request seeks $21 million to scale these efforts within I&A and further institutionalize this important work within Commerce. The Supply Chain Center builds on I&A's mission to enhance the competitiveness of U.S. companies and protect U.S. national security by being: (1) proactive in getting ahead of supply chain challenges with analytic frameworks, deep dives, policy playbooks, and persistent scanning for vulnerabilities; (2) strategic in setting priorities for policy focus and action based on data-driven risk analysis; (3) a force multiplier in improving the targeting and effectiveness of U.S. Government investments; and (4) a partner to industry in building resilient supply chains and ensuring U.S. businesses lead the industries of the future.

ITA is also seeking to expand SelectUSA services to coordinate supply chain priorities with state Foreign Direct Investment (FDI) attraction efforts and recruit high-value investment targets in alignment with supply chain strategies. The FY 2024 Budget seeks $4.75 million for ITA to expand its investment promotion tool kit to target high-value investments in coordination with U.S. states, which would dramatically improve SelectUSA's ability to attract investment into the United States. In addition, ITA will conduct the analysis required to use the specialized expertise and firm-level data needed to develop better strategies for attracting specific individual firms to the United States. Lastly, the requested funds will bolster the Advocacy Center, which works with U.S. businesses to win foreign government public tenders, reflecting the importance of global market access to maintaining the viability of key domestic suppliers.

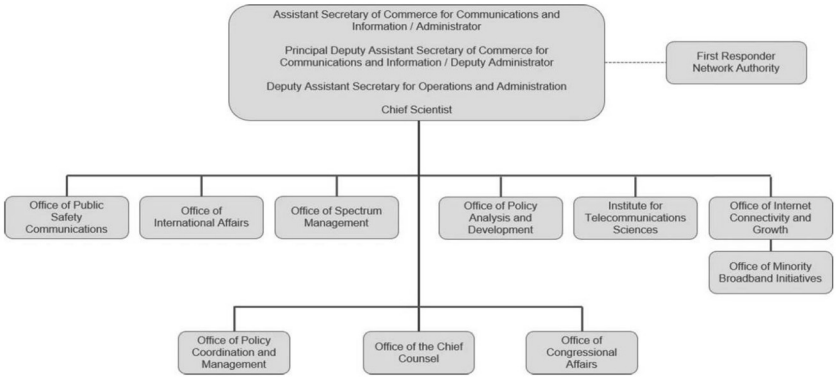
This request is the Global Markets component of an ITA joint proposal with the Industry and Analysis business unit. Global Markets will leverage the analysis, strategies, and recommendations produced by Industry and Analysis under its complementary request to better target FDI toward reducing critical, national supply chain risks.

The National Institute of Standards and Technology (NIST) Manufacturing Extension Partnership (MEP) helps businesses narrow gaps in our supply chains and make manufacturing more resilient. NIST's Manufacturing USA program intends to make available competitive awards to enable existing Manufacturing USA institutes to transition technologies developed at the institutes into domestic production.

Altogether, these investments in critical technologies and regions are essential to maintaining American technological leadership in the world and outcompeting the PRC in a 21st century global economy.

ATTACHMENT 1:

NTIA Organizational Chart:



S&E FY 2023 Q3:

	FTE	Funded Positions	Filled Positions	Vacant Positions
Comparison by activity/subactivity				
Domestic and International Policies	40	49	42	7
Spectrum Management	29	31	26	5
Advanced Communications Research	31	43	34	9
Broadband Programs	38	54	48	6
Public Safety Communications	7	7	6	1
Total	145	184	156	28

Innovation Fund FY 2023 Q3:

	FTE	Funded Positions	Filled Positions	Vacant Positions
Comparison by activity/subactivity				
Public Wireless Supply Chain Innovation Fund Admin	7	10	7	3
Total	7	10	7	3

IIJA FY 2023 Q3:

	FTE	Funded Positions	Filled Positions	Vacant Positions
Comparison by activity/subactivity				
Broadband Equity, Access and Deployment	106	115	101	14
Tribal Broadband Connectivity	21	22	18	4
Digital Equity	13	13	10	3
Middle Mile Deployment	15	16	13	3
	7			
Total	155	166	142	24

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARIA CANTWELL TO DR. SETHURAMAN PANCHANATHAN

CHIPS Underfunded

The CHIPS and Science Act authorized nearly $250 billion in investments for manufacturing, research, and development which is critical for the U.S. to continue to be the world leader in innovation and competition. But we've seen in just the last year that these authorization levels haven't been matched by appropriations.

A report from the Federation of American Scientists shows that the Fiscal Year 2023 omnibus appropriations bill fell short of CHIPS levels by $3 billion, and the

Fiscal Year 2024 appropriations are expected to fall short by nearly $7.5 billion. The authorization levels in this Act are critical to ensuring our future success. That's why I led a letter to the Appropriators asking them to fully fund CHIPS and Science programs.

Question 1. What will the consequences be for U.S. leadership in science, technology, and innovation if appropriations don't match the levels authorized in CHIPS and Science?

Answer. We currently face intense global competition in the race to develop key technology areas such as Artificial Intelligence, Quantum Information Science, and Biotechnology which are rooted in sustained investment over many decades, and to develop the workforce needed to secure the future of innovation. Our success in unlocking the promise of these and other technological developments and scientific breakthroughs will affect our continued global leadership and our economic and national security.

With the passage of the CHIPS and Science Act of 2022, Congress put in place a roadmap for meeting this challenge while also spurring innovation in communities throughout the country. The President's Fiscal Year 2024 Budget Request is an investment in NSF's and the entire Federal STEM enterprise's ability to generate more breakthroughs, foster more innovations that strengthen our economy and national security, and support the individuals who keep the United States a global leader in science, engineering, and technology. Appropriations below this level will run the risk of ceding U.S. leadership in key technologies to our competitors and leaving U.S.-based talent behind.

NSF Regional Innovation Engines

Question 1. In looking at the Regional Innovation Engine applications, what sort of investments in the innovation workforce are you seeing states and companies prioritizing?

Answer. The NSF Engines program is part and parcel in alignment with NSF's emphasis on harnessing the geography and demography of innovation that exists across the country. There is talent everywhere—and it is incumbent upon us to create opportunities for that diverse talent, regardless of background or location.

When we launched the program last year, the response from the community exceeded even our own expectations: TIP received nearly 700 concept outlines for NSF Engines spanning more than 500 organizations (including 40 percent that had not previously received funding from NSF) from every state and territory.

The NSF Engines program allows the proposers to prioritize key technology focus areas and societal, geostrategic, and national challenges of interest to their local economies. NSF Engines finalists have proposed everything from breakthrough agricultural technologies for food system adaptation to quantum technology development to additive manufacturing.

Each NSF Engine must bring together partners across diverse sectors—institutions of higher education, state, local, and tribal governments, nonprofits, and vocational/workforce development groups. As an example, recent NSF Engines Development Awardee winners include up to 80 partners on each award. (To see the myriad partners involved with each NSF Engines Development Award or each NSF Engines Finalist, *visit the map.* You can also download these data.)

Across this portfolio of funded projects and finalists, we are seeing extensive focus on workforce development—spanning all levels from K–12 to adult and continuing education, and training for all job types including technicians, practitioners, researchers, entrepreneurs, and educators. Indeed, the NSF Engines program has catalyzed novel partnerships between academia, industry, government, and civil society in an incredibly powerful way. As an example of the potential exhibited by the NSF Engines program, at least one private foundation/philanthropy has reached out about partnering with NSF to provide an infusion of funding to several NSF Engines Development Awards focused on K–12 education innovation.

Ultimately, to remain globally competitive, the U.S. requires a robust workforce, one that is intentionally trained, recognized and valued for their contribution to the research enterprise. These will be fundamental drivers of national transformation that promotes equity among institutions and organizations seeking external funding and serves to facilitate diversity of thought, experience, and perspectives.

Question 2. Engaging with community colleges and Minority Serving Intuitions are vital to developing a more diverse workforce. Of the 16 finalists announced for the NSF Engines Type-2 awards, what is the makeup of community colleges and MSIs? When does NSF expect to announce the final awards?

Answer. At least 12 of the 16 NSF Engines finalists include at least one community college and/or MSI, and in many cases, an NSF Engine finalist comprises mul-

tiple diverse institutions as part of its composition. NSF anticipates announcing the NSF Engines awards this winter.

Increasing and Accelerating Industry Partnerships

Under your leadership, NSF has been increasing its jointly funded research partnerships with industry, such as the Future of Semiconductors (FuSe) program and the Resilient & Intelligent NextG Systems (RINGS) program.

Through the FuSe program, The University of Washington in Seattle is partnering with other universities, including Howard University, to develop new materials for energy efficient and enhanced-performance semiconductor-based systems.

Question 1. Can you describe how you plan to continue increasing these partnerships, such as by scaling and expanding successful industry-led programs, as well as bringing in new industry sponsors to increase the total potential award funding?

Answer. NSF cultivates partnerships to accelerate transformative research, solve societal problems, fuel economic progress and build a future-ready workforce. The Foundation stimulates partnerships indirectly through programs that require or encourage grantees to work in collaboration with non-academic entities. NSF also engages in direct external partnerships with other U.S. Federal agencies, with industry, private foundations, non-governmental organizations (NGOs), and with international organizations. FuSe and RINGS are examples of NSF's direct partnerships. We recognize that direct partnerships with industry can provide resources that accelerate basic research, speed the transition of basic research to the market, and support workforce development. At the same time, NSF is cognizant of certain risks, such as intellectual property considerations and perceptions of competitive advantage. NSF has developed guiding principles to understand risks, costs, and benefits of potential partnerships, as well as implementation factors to consider. Using our strategic and careful approach to partnerships, and with the establishment of the Directorate for Technology, Innovation, and Partnerships (TIP), we anticipate that NSF's direct partnerships with industry will continue to grow.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. TAMMY BALDWIN TO DR. SETHURAMAN PANCHANATHAN

The CHIPS and Science Act calls on the National Science Foundation to broaden participation of underrepresented groups in science, technology, engineering, and mathematics (STEM) to enable the scientific potential of all Americans. Studies suggest that LGBTQ people are underrepresented in the STEM workforce. CHIPS & Science created a new Chief Diversity and Inclusion Officer role that can help address this problem.

Earlier this year, Senator Feinstein and I led our colleagues in calling on the National Science Foundation to better assess representation in STEM by adding voluntary sexual orientation and gender identity questions to its national workforce surveys.

Question 1. Can you please provide an update on these efforts and when we should expect a final decision and the inclusion of this data in the National Science Foundation's biennial reports to Congress?

Answer. NSF and the National Center for Science and Engineering Statistics (NCSES) are committed to producing data that reflects the population engaged in STEM activities in the United States—including the LGBTQI+ population, while protecting privacy. This is why NCSES has undertaken a robust research effort to identify the best ways to collect information on sexual orientation and gender identity (SOGI). As you know, in order to ensure that resulting data accurately reflect the population, it is essential that we continue to assess the complexity, sensitivity, and performance of these questions within the unique context of NCSES's education and workforce surveys (which differ from the settings in which similar questions may be asked on other surveys), while maintaining the privacy of respondents.

We have already added a question on gender identity to the 2023 National Survey of College Graduates (NSCG); we expect these data to be released in approximately late 2024.

NCSES is also conducting testing of questions related to sexual orientation and gender identity as part of the 2023 NSCG, as well as the 2023 Survey of Doctorate Recipients, and the 2024 Survey of Earned Doctorates. NCSES is also in the process of seeking OMB clearance to conduct similar testing on the 2024 National Training, Education, and Workforce Survey, which will provide data on the skilled technical workforce.

NCSES is committed to releasing the results of this research in a timely and transparent manner and communicating to stakeholders how these results inform future data collection decisions. These efforts are coordinated by the Office of Management and Budget's Office of the Chief Statistician of the United States, to ensure the maximum utility of the research questions under examination across the Federal statistical system and prevent duplication of effort.

We are extremely excited about the planned release of gender identity data in late 2024 and the current testing occurring on our other workforce surveys that will inform future data releases. NSF and NCSES are committed to providing Congress with policy-relevant information based on the best available data in its biennial reports. As part of the process of producing the Diversity and STEM and Science and Engineering Indicators reports, we assess the availability of data that may shed light on salient policy issues and whether such data are appropriate for inclusion given available resources and constraints such as scope, length, timeliness, and representativeness. We expect to undertake similar assessments of SOGI data—if available—for future cycles of these publications.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. TAMMY DUCKWORTH TO DR. SETHURAMAN PANCHANATHAN

CMB–S4

As you know, the cosmic microwave background (CMB) carries information about the very early universe. Astronomers use the patterns in CMB light to determine the total contents of the universe, understand the origins of galaxies and look for signs of the very first moments after the Big Bang. The "Stage-4" of this ground-based CMB experiment, CMB–S4, consists of dedicated telescopes equipped with highly sensitive superconducting cameras and DOE and NSF have partnered with the University of Chicago, Argonne National Lab and Fermilab to be a part of this critical research.

Using advanced telescopes to be located at the South Pole and in the Chilean Atacama plateau, CMB–S4 will provide the leap in technology and size needed to answer these important questions, not just incrementally move towards it. The technology advancements include pushing the frontier of cryogenic superconducting electronics and sensing elements, such as those at the core of quantum technology. The project provides a real-world opportunity to field advanced renewable energy research at the South Pole and provides opportunities for STEM engagement with broad outreach for student engagement in primary education as well as post-secondary education.

Over the last decade the CMB–S4 has repeatedly received high profile support from the broad Physics and Astronomical communities, including a strong recommendation from the 2020 Decadal Survey of Astronomy and Astrophysics. This recommendation follows enthusiastic endorsements from the Astronomy and Astrophysics Advisory Committee, as well as from the 2015 NAS/NRC report on NSF Investments in Antarctic and Southern Ocean Research and the 2014 Particle Physics Projects Prioritization Panel (P5), which recommended pursuing CMB–S4 under all budget scenarios.

Question 1. Given the importance of CMB–S4 to science, technology and our Nation's global leadership, when will the National Science Foundation (NSF) advance CMB–S4 as a candidate major facility project into the Major Facility Design Stage and what are NSF's plans to maintain the U.S. leadership in scientific research at the South Pole?

Answer. NSF's established processes for advancing a project into the Major Facility Design Stage are documented in the Research Infrastructure Guide. NSF is currently considering the cost, schedule, and availability of sites for the CMB–S4 project. The timing for advancement of CMB–S4 into the Major Facility Design Stage is not yet determined. If constructed, CMB–S4 is envisioned as a partnership between NSF and the Department of Energy; the two agencies meet frequently through a Joint Oversight Group to coordinate planning activities.

NSF is currently developing a South Pole Station Master Plan to enable the long-term support of forefront science such as CMB–S4 at the South Pole.

Critical Materials

Question 1. Please identify the most troubling risks NSF has identified in the critical mineral supply chain.

Answer. Critical minerals are typically sourced directly from primary resources (extracted from the Earth's crust) through well-established conventional mining operations. The timelines to reestablish domestic supply chains, especially mining op-

erations, are long; establishing new mines can take decades due, in part, to environmental issues, regulatory requirements, and local community concerns. While significant reserves of critical minerals exist on the seafloor at sites around the globe, seafloor extraction processes may cause major impacts on biological ecosystems, both locally at the extraction site and farther afield. Such impacts remain poorly characterized. Current minerals and materials sourcing also can involve significant geopolitical risks given the weak governmental and regulatory structures in many countries.

The challenge extends beyond extraction to processing, and in this respect there is a need for new, scientifically-driven approaches to the sustainable processing and recycling of critical minerals. There are also workforce needs. We lack a sufficient roster of scientifically and technically trained personnel at all levels in the critical minerals ecosystem: across exploration, extraction, processing, and manufacturing. Also, university scientists and engineers working in this sector have limited options to obtain funding for fundamental and translational research; Federal support for innovation in the critical minerals ecosystem is not matched with national needs.

Question 2. Please describe what steps the United States must take to better partner with allied countries to secure critical minerals, while lessening our Nation's dependence on sourcing critical minerals mined by firms our countries with strong ties to competitor and adversarial regimes, such as the PRC and the Russian Federation, since such sourcing often results in adverse humanitarian and national security costs.

Answer. To reduce dependence on adversarial foreign critical mineral supplies, the United States must survey and characterize domestic resources/reserves for the most domestically essential minerals/metals; developmental timelines that are mapped to national needs must be established for the exploitation of these reserves. The United States must stimulate fundamental research in alternate materials, material reuse and recycling, and improved extraction processes, leveraging international expertise as appropriate. The United States must leverage existing capabilities and build partnerships with friendly nations having significant resources and capabilities complementary to and/or more advanced than that which we have domestically. The United States must develop a robust, competent workforce across the critical minerals ecosystem, for example by building out research and student exchange partnerships with allied nations. The future security of international critical minerals supply chains must be reinforced by preventing them from becoming compromised by severe adverse environmental and human health impacts.

Quantum Technology

Question 1. How does quantum technology factor into the future of microelectronics beyond silicon CMOS, as envisioned in the CHIPS + Science Act, and in what ways will CHIPS support these and other next generation microelectronics and semiconductor technologies?

Answer. NSF has several programs that are deeply involved in researching ways for new quantum discoveries and materials to impact the future of micro-electronics beyond silicon including developing whole new classes of semiconductors and their uses. This is exemplified by the NSF initiative of Future of Semiconductors (FuSe) and two Material Innovation Platforms: the Platform for the Accelerated Realization, Analysis, and Discovery of Interface Materials (PARADIM) and the 2D Crystal Consortium (2DCC).

For decades, NSF investments have been informed by a combination of top-down priorities (from Administrations and Congress), bottom-up inputs (from the research community that NSF serves, including through NSF-funded conferences/workshops), and data-driven analytics that serve to identify emerging areas as well as gaps in NSF's proposal and award portfolios. As outlined in the FY 2024 President's Budget Request for NSF, building upon more than three decades of exploratory discovery, NSF investment in quantum information science (QIS) will help propel the Nation forward as a leading developer of quantum technology. This investment is a key component of the National Quantum Initiative and addresses Administration and Congressional interest in advancing key technology focus areas.

Importantly, NSF's QIS investments build upon the agency's longstanding and continuing foundational investments in QIS as well as more recent, interdisciplinary investments in centers and small teams and targeted workforce development efforts. Moreover, increasingly, a systematic approach to maturing foundational quantum discoveries into use-inspired technological innovation is critical to transform the field of QIS and rapidly accelerate broader impacts to society.

Pursuant to the CHIPS and Science Act of 2022, NSF established the Directorate for Technology, Innovation and Partnerships (TIP) to specifically accelerate the development of key technology focus areas, including semiconductors/microelectronics

and QIS, as well as their impact on the Nation's long-term economic competitiveness. In alignment with this vision, TIP is closely collaborating with other NSF directorates to accelerate technology development and translation across the full complement of 10 key technology focus areas identified in Sec. 10387 of the legislation. A key focus is on maturing technology by integrating end-users and potential customers from a full complement of science and engineering fields and economic sectors into cycles of research, development, and demonstration, resulting in co-design and co-creation of novel solutions that can be accelerated to the market and society.

As an example, in response to the National Quantum Initiative and in coordination with the National Quantum Coordination Office (NQCO), TIP is collaborating with the NSF Directorate for Mathematical and Physical Sciences (MPS), which leads the agency's QIS investments, as well as with the Directorates for Biological Sciences, Computer and Information Science and Engineering (CISE), STEM Education (EDU), and Engineering (ENG) on the development of a new initiative called the National Quantum Virtual Laboratory (NQVL). The NQVL will support a highly accessible shared research infrastructure framework that draws on the full spectrum of expertise throughout the Nation to rapidly translate QISE ideas formulated in the laboratory through prototyping, validation, at-scale testing, and eventual full-scale deployment. Beyond fostering use-inspired and translational QIS research, the NQVL will democratize access to the varied resources and environments necessary to conduct such cutting-edge research, lower barriers to entry throughout the QIS research enterprise and promote broadened participation of talent anywhere and everywhere.

Additionally, TIP is collaborating with CISE, EDU, ENG, and MPS on a new Future of Semiconductors (FuSe) program, which invested $45.6 million—including funding from the CHIPS and Science Act—in 24 research and education projects to enable rapid progress in new semiconductor technologies and manufacturing as well as workforce development. The FuSe program, a public-private partnership between NSF and Ericsson, IBM, Intel, and Samsung, takes a unique and intentional holistic, "co-design" approach that advances materials, devices, and systems integration, while simultaneously considering the performance, manufacturability, recyclability and environmental sustainability of these materials, devices, and systems. The FuSe program is also accelerating the development of the U.S.-based workforce and knowledge that enable innovative semiconductor and microelectronics.

We believe there is strong synergy between our work in semiconductors and QIS.

Emerging Research Institutions

The CHIPS and Science Act takes important steps to support research at emerging research institutions (ERIs)—higher-education institutions with less than $50 million in annual Federal research expenditures—through a number of provisions, including section 10325, which created a five-year ERI partnership pilot program.

Question 1. Please provide an update on the implementation of Section 10325 and the concrete timeline for establishing the ERI partnership pilot program.

Answer. Appropriated funding levels well below the President's Request left NSF unable to undertake all of the activities outlined in the Act, including Sec. 10325(c).

While we cannot yet carry out a formal program at this time, NSF encourages partnerships and funded awards to include ERIs throughout the country. For example, all recently awarded NSF Artificial Intelligence Research Institutes include at least one ERI as a funded partner. In FY 2023, the Major Research Infrastructure program made instrumentation awards to over 40 primarily undergraduate institutions (PUIs), which are typically ERIs. Additionally, in FY 2023, the Established Program to Stimulate Competitive Research (EPSCoR) statewide awards in its Track 1 Research Infrastructure Improvement Program included collaborations with a total of 74 PUIs.

Large collaborative center awards also often demonstrate partnerships between ERIs and more research-active institutions. For example, three-quarters of the FY 2023 Science and Technology Center awards included partners who are ERIs. The Gen-4 Engineering Research Centers call specifies that the lead or at least one of the core partner universities must be a university that serves populations of traditionally underrepresented students, which is expected to result in many new ERCs in FY 2024 including partners who are ERIs.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. KYRSTEN SINEMA TO
DR. SETHURAMAN PANCHANATHAN

Giant Magellan Telescope

The Giant Magellan Telescope (GMT) now being built in Chile is a leading example of what can be accomplished by a consortium of U.S. academic institutions and international partners. I am proud that both the University of Arizona and Arizona State University are involved in this historic effort. This is another example of the unique work that the University of Arizona has done in astronomy and the unmatched quality of the mirrors it produces in Tucson. There is tremendous support in the Senate to advance GMT to obtain the generational scientific benefits it promises.

But GMT cannot succeed without continued significant investment. Such investment will accelerate development activities of the top priority of the National Academies' Decadal Survey; namely the US-Extremely Large Telescope Program (US–ELTP) consisting of the GMT, the Thirty Meter Telescope (TMT) and the NSF's National Optical-Infrared Astronomy Research Laboratory (NOIRLab). I appreciate the NSF's $6.5 million award for GMT earlier this month under the US–ELTP program. With the GMT, the NSF will continue leverage the significant philanthropic, state, and non-US investments already made by existing GMT partners.

GMT and TMT would together provide American astronomers with newfound access to observe 100 percent of the sky in the Southern and Northern hemispheres, respectively. However, as you know these two telescopes have significant differences in their sites, technical challenges, and timelines. In fact, GMT is already deeply into its development phases: GMT has cast and polished mirrors for several years, with its seventh and final primary mirror fabrication underway. Ultimately, GMT has not faced the same site issues as TMT.

Question 1. Has the NSF considered decoupling funding or other forms of continued investment, prioritization, or considerations for GMT from the TMT given GMT does not face some of the same challenges that TMT does?

Answer. NSF is currently managing the U.S. Extremely Large Telescope Program (US-ELTP) as a three-element system to deliver optimal access to 30m-class telescopes for the U.S. astronomical community, including the two ELTs: the Thirty Meter Telescope (TMT) in the northern hemisphere, and the 25-meter Giant Magellan Telescope (GMT) in the southern hemisphere. The third element of US-ELTP is the critical community science interface and support, which includes data management and software tools and services to be provided by NSF's National Optical-Infrared Astronomy Research Laboratory (NSF's NOIRLab). Each of these elements is being considered separately in the Major Facility Design Stage process, with separate reviews of technical and programmatic readiness.

Question 2. If so, could you please provide clarification on what NSF is considering as far as separating the potential progress and continued support for GMT from TMT as it works to realize the goals of the US–ELTP?

Answer. Although presented under the umbrella of the US–ELTP, NSF recognized early on that each element faced significantly different challenges and may need separate risk mitigation strategies and advancement milestones. As such, NSF admitted GMT and TMT into the Major Facility Design Stage as separate projects and held separate Preliminary Design Reviews for them to provide independent external reviews of their technical readiness. NSF also held separate internal Facilities Readiness Panel reviews to evaluate the readiness of each project to advance to the Final Design Phase. Going forward, the two telescope projects will continue to be evaluated separately, while NSF continues to optimize the overall US–ELT program to provide the U.S. astronomical community the access to 30m-class telescopes that will allow them to continue to lead the world in the exploration and understanding of our universe.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JACKY ROSEN TO
DR. SETHURAMAN PANCHANATHAN

Initiatives in STEM Funding

I'm proud to have secured a bipartisan provision based on my *Rural STEM Education Act* in the *CHIPS and Science Act.* This historic bipartisan law would break down barriers to rural STEM education through grants from the National Science Foundation. Nevada is home to nearly 7,500 students who attend rural schools and this law gives them opportunities in STEM education and careers. Yet, there is still more work to be done to address the challenges standing in the way of students of all ages, genders, and backgrounds from pursuing STEM education and careers.

Question 1. What are the benefits of rural STEM education and how NSF is working to break down barriers for students in rural and underserved communities?

Answer. NSF is fully committed to the development of a future-focused science and engineering workforce that draws on the talents of all Americans, in every region of the country. Maintaining our position at the vanguard of discovery and innovation requires that we enable innovation anywhere and opportunities everywhere—this of course includes the STEM talent that we know exists in rural communities.

Individuals living in rural areas face roadblocks to high-quality STEM education and accessible pathways into the STEM workforce. Overcoming these disparities in STEM achievement is possible by addressing a variety of long-standing issues. For example, creating and supporting networks of mentors, increasing opportunities for experiential learning, improving preparation for K–12 teaching and provision of more teacher resources, and making college more affordable.

Everyone deserves a high-quality STEM education, but access to such an education is not equally distributed across the country. NSF investments aim to disrupt this condition by reaching countless underserved students and under-resourced teachers in rural areas around the country.

Expert knowledge and diverse perspectives are key to maintaining our Nation's preeminence in science and engineering. And by investing in learners from all geographic areas, EDU is working to grow a vibrant and diverse U.S. STEM workforce, through funding opportunities such as the Advanced Technological Education (ATE) program. Creating opportunities everywhere –including in rural areas—advances the frontier of innovative STEM research and development. This effort helps broaden pathways for domestic learners to join the future STEM workforce. And reaching rural communities presents a great opportunity to demonstrate the value of Federal investments in science and engineering.

A recent look at our portfolio revealed that EDU has nearly 500 active awards that are investigating aspects of rural STEM education. Clearly, this is an important area in which NSF/EDU is investing.

NSF sponsored a recent convening on "K–12 Rural STEM Education and Workforce Development" at the National Academies (in fulfillment of the "CHIPS and Science Act"). This was an open session/conversation to learn more about the development of the legislation from congressional staffers and hear about high-level overview of the issues in rural STEM education and rural broadband and connectivity issues.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. BEN RAY LUJÁN TO DR. SETHURAMAN PANCHANATHAN

By expanding authorities for not just the National Science Foundation, but also the Departments of Energy and Commerce, the CHIPS and Science Act makes clear that no single department or agency can do it alone. The scientific challenges we face are too big, the timeline to meet these challenges is too short, and the international competition is too strong. I was pleased to see that NSF and Department of Energy signed an MOU to partner on finding solutions to the scientific challenges of the 21st century.

Question 1. Can you share with the committee some concrete examples of how NSF will leverage the vast and deep capabilities of the DOE national lab system to meet the challenges of the 21st century?

Answer. In January of this year, NSF and DOE's Office of Science signed a memorandum of understanding that will enable increased partnerships to address some of our most important challenges. This MOU builds upon previous partnerships and provides opportunities for collaboration on biotechnology, quantum information science and engineering, advanced manufacturing,, artificial intelligence and machine learning.

NSF and DOE's robust partnership includes access to various NSF-and DOE-managed multi-user facilities around the globe. One recent success from that partnership is the NSF-supported work of researchers at the University of South Carolina who collaborated with the DOE's Sandia National Laboratories. The researchers have created a new type of porous material with unique nanoscale properties that can potentially enable superior hydrogen storage solutions—an innovation that would be useful for fuel cells used in vehicles, backup power supplies and other applications.

The NSF and DOE work together on many important projects, including the National High Magnetic Field Laboratory (NHMFL). The NHMFL is the largest and most powerful magnet facility in the world, and it is used by scientists from all over the globe to conduct research in a wide range of fields. The NSF supported NHMFL

is located at three different sites: Florida State University, the University of Florida, and the DOE Los Alamos National Laboratory (LANL). Each site has its own unique capabilities, and together they work to advance our understanding of high magnetic fields and their applications, which may lead to the technologies and scientific solutions of tomorrow.

An additional success from this partnership is an NSF–DOE-supported award for Accelerating Innovations in Biomanufacturing Approaches through Collaboration Between NSF and the DOE BETO funded Agile BioFoundry, a consortium of national laboratories dedicated to accelerating biomanufacturing and decarbonizing the economy.

University of Georgia researchers and DOE's Agile BioFoundry will work to increase understanding of the metabolic pathways that allow a novel microorganism to produce hexanoic acid, that can be engineered to create sustainable aviation fuel among a host of other carbon neutral products.

Another example of the NSF–DOE partnership is the newly awarded Synchrotron for Earth and Environmental Science (SEES) facility to the University of Chicago. SEES provides researchers access to a suite of analytical instrument capabilities at synchrotron beam sources across the country, including Argonne National Laboratory, Lawrence Berkeley National Laboratory, Brookhaven National Laboratory and SLAC National Accelerator Laboratory. The facility enables a range of research from critical mineral formation to natural hazards mediation to future technological advancements and human health.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. RAPHAEL WARNOCK TO DR. SETHURAMAN PANCHANATHAN

Regional Technology Hubs and Geographic Diversity

The CHIPS and Science Act (P.L. 117–167) authorizes regional technology hub programs within various agencies, including at the Economic Development Administration (EDA) and National Science Foundation (NSF). This legislation also requires geographic diversity within each program.[1]

Question 1. How does geographic diversity in these programs contribute to our national security and our ability to compete on the global stage?

Answer. The NSF Engines program aims to catalyze regional-scale innovation ecosystems across the country, particularly in parts of the Nation that have not benefited from the technology booms of the last few decades. NSF Engines represent regional coalitions that cross county and state borders and focus on advancing technologies to address pressing national and societal challenges and create economic opportunities across the U.S.

Investment in NSF Engines is predicated on the fact that the U.S. has ceded leadership in too many areas such as semiconductors, manufacturing, and the bioeconomy—technologies that were built on American ingenuity and Federal funding. When we cede such leadership, we see the aftereffects—consider the semiconductor shortage and supply chain crisis last year, the effects of which we are still feeling today. We cannot let that be our future in AI, quantum, wireless, and more; we cannot wake up one morning with this realization. If we don't address these areas immediately, our economic and national security will pay the price.

If the United States wants to continue to lead in research and innovation, we need to invest in both fundamental research and translation. We need to create the technologies and jobs of the future through such investments. We also need to ensure that we have a workforce—a broad and diverse workforce—who are prepared for the jobs of today and tomorrow.

It has been said that America's diversity is our unique competitive advantage. We need more people and more ideas from every part of the U.S. By ensuring that more people and states have access to Federal funding as the NSF Engines program strives to do, American innovation can keep the U.S. competitive across all technology areas.

Question 2. How will you coordinate across agencies to ensure geographic diversity across all programs created under the CHIPS and Science Act?

Answer. In July 2023, NSF announced a Memorandum of Understanding (MOU) with the U.S. Economic Development Administration (EDA) to officially enable cross-agency coordination on regional innovation programs (*https://new.nsf.gov/news/nsf-eda-announce-official-coordination-regional*). Indeed, NSF and EDA share

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[1] *See, e.g., https://www.eda.gov/funding/programs/regional-technology-and-innovation-hubs/faq; https://www.nsf.gov/pubs/2022/nsf22082/nsf22082.jsp.*

a mutual commitment to regional innovation and economic development in communities across the Nation. The CHIPS and Science Act authorizes both agencies to implement programs to enable regional technology development and economic and job growth through the NSF Engines and the EDA Regional Technology and Innovation Hubs (Tech Hubs) programs, but at different stages of technological development. The NSF Engines program will catalyze and foster innovation ecosystems across the U.S. by advancing use-inspired research in key technology focus areas, while also addressing regional, national, societal, economic, and geostrategic challenges. Under the Tech Hubs program EDA is authorized to designate and invest in the planning and implementation of geographically distributed regional technology hubs that will focus on technology advancement and commercialization, job creation, and strengthening U.S. competitiveness. Geographic diversity is a fundamental tenet of both programs, which seek to identify and invest in areas of the country, including small and rural communities, that have the potential to become global leaders but have been overlooked as technology investments have been concentrated in a handful of established regions.

Collectively, these programs—along with many of the agencies' other investments, like EDA's Build Back Better Regional Challenge awards—will accelerate technology advancement and commercialization, innovation and entrepreneurship, job creation and workforce training, and more. Ultimately, NSF Engines and EDA Tech Hubs speed and scale research and development outputs and enable economic opportunities nationwide; in turn, they contribute to regional economic growth and U.S. competitiveness in key technology areas. *Visit the map* of various NSF and EDA initiatives.

Beyond the NSF Engines and EDA Tech Hubs programs, the CHIPS and Science Act authorized many other initiatives across the U.S. Government with a focus on harnessing the geography and demography of innovation. In addition, several preexisting programs also have this focus. For example, the CHIPS-mandated Subcommittee on Microelectronics Leadership (SML), with representation across microelectronics-active agencies including NSF and the Department of Commerce, convenes frequently to ensure open interagency communication and coordination on this focus across a range of investments.

Question 3. Among the 16 finalists for the NSF Regional Engines award, how many can expect to be funded by the program?

Answer. NSF received $200 million in FY 2023 Appropriations for the NSF Engines program, of which we invested $43 million on 44 NSF Engine Development Awards and $20 million on nearly 50 capacity-building awards at HBCUs, MSIs, and other emerging research institutions. The remaining funding will go toward supporting the first two years of NSF Engines awards. The actual number of awards will be dependent upon the quality of the proposals received.

Question 4. Does NSF expect to conduct a second solicitation round for NSF Type 2 Engines?

Answer. The President's FY 2024 Request includes funding for a second round for the NSF Engines program. A final decision will be subject to appropriations. NSF intends to be ready to issue a new NSF Engines funding opportunity in Spring 2024.

Question 5. Is cybersecurity a focus area for the NSF Regional Engines program?

Answer. The NSF Engines program supports projects across all key technology and challenge areas as outlined in the CHIPS and Science Act of 2022, including cybersecurity. Of the NSF Engines Development Awardees, 19 are working on cybersecurity challenges with a total investment of $18.8 million across 27 states and territories.

Question 6. Will you commit to coming to Georgia to see the developments in technology, manufacturing, and research happening in our state?

Answer. The Director would be delighted to visit!

HBCU Research Capacity Building

Institutions of higher education conduct crucial research that helps drive American innovation and build a talented workforce pipeline that strengthens American competitiveness; however, Minority-Serving Institutions and Historically Black Colleges and Universities (HBCUs) may lack the capacity or institutional knowledge to access Federal research funding opportunities.[2] In light of this concern, the CHIPS

[2] *See https://tcf.org/content/commentary/testimony-the-value-of-hbcus-should-be-recognized-through-greater-public-investment.*

and Science Act directs NSF to provide grants to build institutional research capacity at HBCUs.[3]

Question 1. Why is it important to build research capacity at HBCUs?

Answer. HBCUs play an important role in our research and education ecosystem, conferring approximately 18 percent of all STEM-related Bachelor's degrees that go to Black/African American students in the U.S. and approximately 1/3 of STEM doctoral degrees. At NSF, we believe that talent and opportunities are everywhere, and it is in our collective interest to ensure that everyone can participate in driving innovation. Georgia is home to many of our Nation's HBCUs and NSF is committed to research capacity building efforts at these institutions so that they can contribute to fundamental discovery and basic research in the United States. Despite significant contributions that HBCUs make in education, training, and STEM workforce development, these institutions are systemically and historically underfunded and under-resourced, which limit their research competitiveness.

Question 2. What is NSF doing to build institutional research capacity at HBCUs?

Answer. Initiatives such as our new GRANTED program are aimed directly at building research capacity at institutions such as MSIs and Emerging Research Institutions. In fact, NSF recently announced a GRANTED award to Emory University to support the expansion of the National Organization of Research Development Professionals (NORDP) Consultants Program. This $9.2M NSF awards aims to increase the capacity at 16 MSIs and HBCUs to develop research projects, secure funding and engage students in research.

The NSF Historically Black Colleges and Universities—Excellence in Research (HBCU-EiR) program strengthens research capacity at HBCUs by providing opportunities for both public and private HBCUs, particularly for those who have not been successful in larger NSF Research & Related Activities competitions. HBCU-EiR aims to stimulate sustainable improvement in HBCUs' research and development capacity. Clark Atlanta University, Morehouse College, Morehouse School of Medicine, Savannah State University, and Spelman College have all been recipients of HBCU-EiR awards. In FY 2023, the HBCU-EiR program also supported planning grant awards to HBCUs for initial conceptualization, planning, and collaboration activities in formulating plans for a future submission to the HBCU-EiR program. Additionally, in September 2023, the HBCU-EiR program released a new funding opportunity (Advancing Research Capacity at HBCUs through Exploration and Innovation, ARC–HBCU) to support collaboration among HBCU faculty, research administrators, and academic leadership to explore innovative approaches for addressing the HBCUs' research capacity needs. Project outcomes have potential to lead to new models and practices that will sustainably increase research capacity at HBCUs. The first ARC–HBCU awards will be made in FY24.

The Louis Stokes Alliances for Minority Participation Program (LSAMP) emphasizes the development of broad-based regional and national alliances of academic institutions, school districts, state and local governments, and the private sector. All work together to increase the number of STEM degrees awarded to underserved and underresourced students in STEM disciplines. And to broaden pathways to advance STEM degrees, LSAMP launched the Bridge-to-the Doctorate (BD) program, which provides financial support and the necessary academic and research skills that enable students to thrive in STEM graduate degrees. So far, more than 2500 students are recipients of BD fellowships.

For 25 years, NSF's Historically Black Colleges and Universities—Undergraduate Program (HBCU–UP) enhances the quality of undergraduate STEM education and the research capacities of HBCUs and other minority-serving institutions across the country. Through this program, NSF has invested in countless research projects that are driving the fields of machine learning, cognitive psychology, renewable energy, and much more.

At Spelman College, researchers seek to understand how assessment practices in post-secondary mathematics courses can impact Black female students' academic achievement on tests, retention in other courses, and mathematical identity and agency. Results from this project will add important insights to the body of knowledge about grading in higher education.

HBCU–UP funding is aiding Albany State College in Georgia to strengthen faculty research capability and improve research and teaching at the institution.

And at Savannah State University, researchers are developing machine learning models that will be used as an aggregate quality classification tool by highway agencies. The project will also develop an undergraduate research program that will prepare undergraduate students for careers in transportation geotechnics.

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[3] *See, e.g.,* Pub. L. No. 117–167, tit. 5 § 10524.

The Centers of Research Excellence in Science and Technology (CREST) program provides support to enhance the research capabilities of minority-serving institutions by establishing centers that effectively integrate education and research. CREST promotes the development of new knowledge, enhancements of the research productivity of individual faculty, and an expanded presence of students who are members of groups underrepresented in STEM disciplines.

Most recently, a new project to launch a CREST center at Morgan State University (an HBCU in Maryland) will focus on advanced magnets, semiconductors and developing the workforce in these areas. These fields are of great importance to modern technologies and the Nation's economy. The project is partially funded by the "CHIPS and Science Act," and it fits well with the current Administration's priorities.

CREST plays a role nationwide in expanding the presence of students historically underrepresented in STEM disciplines:

North Carolina A&T became the first HBCU to receive an NSF ERC award. This started out as a CREST Center, which then evolved into an Engineering Research Center that supports convergent research, education, and technology translation at universities that will lead to strong societal impacts.

Prairie View A&M University is addressing important questions about reducing carbon dioxide emissions, increasing the sustainability of fossil fuel energy sources, and improving the technological efficiency of bioenergy and offshore wind energy. The Environmental Sustainability subproject focus is on process engineering and stochastic methods to enhance the sustainability of fossil fuel energy sources, and life cycle assessment. (PRAIRIE VIEW A&M UNIVERSITY—NSF CREST Center for Energy & Environmental Sustainability—Phase II).

And at UDC, the CREST Center for Nanotechnology Research and Education is advancing engineering curriculum. It is integrating multidisciplinary nanotechnology education and hands-on laboratory experience in graduate, undergraduate, and high school courses. It is working to attract, train, and retain students, focusing on underrepresented groups, for STEM workforce.

Question 3. How is NSF measuring the success of these efforts to build institutional research capacity?

Answer. At this time NSF relies primarily on annual reports from individual projects to glean information about i) undergraduate and graduate students whose research is supported by the project and ii) the matriculation status of those students. Professional development opportunities taken by members of the PI team and their students are also reported. Each new annual cohort of awardees generally represents an increase in the number of new PIs. For example, both Clark Atlanta University and Spelman College have each received four HBCU–EIR awards since FY 2018. Each annual report generally also reports the engagement of new undergraduate students from year to year. Each project also engages a different cohort of students as the research area of each project is different and led by a different PI.

Question 4. What are the best practices for non-HBCUs to strengthen research partnerships with HBCUs, or vice versa?

Answer. Non-HBCU and HBCU collaborations can serve as critical partnerships that further enhance the research competitiveness of HBCUs through leveraging and complementing one another's strengths, benefiting both non-HBCUs and HBCUs. Specifically, while HBCUs can offer non-HBCUs best practices on recruiting and retaining students of color for STEM undergraduate and graduate studies and the STEM workforce, non-HBCUs may offer opportunities for HBCU faculty to develop sustainable expertise and long-term plans for their research program and career trajectories through shared infrastructure, human resources, and teaching support. An additional critical best practice is maximizing opportunities for the intersection of all entities that make up the research ecosystem, including federal, nonfederal, state, local, and industry engagement.

Workforce and Community Colleges

A skilled domestic workforce is critical to the success of investments in the CHIPS and Science Act (P.L. 117–167), including those in semiconductor development, information technologies, manufacturing, and biotechnology. Community and technical colleges are well positioned to respond to the relevant emerging technologies workforce needs by providing shorter-term, experiential or work-based learning for a broad population of students, including rural Americans and those from underrepresented backgrounds.

Question 1. What roles do community and technical colleges play in addressing workplace shortages?

Answer. Community colleges play a critical role in addressing STEM workplace shortages. They offer educational opportunities for individuals who are historically underrepresented in STEM, and they can act as a pathway into four-year institutions of higher education and into workforce opportunities in emerging technologies of national importance, including semiconductor design, advanced manufacturing, cybersecurity, and more.

The Advanced Technological Education (ATE) program is NSF's key effort that helps to boost the skilled technical workforce—the sector of jobs that requires more than a high school diploma but less than a bachelor's degree. ATE provides grants to improve technician education at community colleges and in the Career and Technical Education programs in high schools. And the program funds projects that improve technical education in all the high-tech fields that drive the economy—biotech, cybersecurity, advanced manufacturing, microelectronics, semiconductor manufacturing, electric vehicle manufacturing, artificial intelligence, nanotechnology, etc. ATE reaches nearly 40,000 students and 9,000 teachers annually.

The country is currently experiencing a major shortage in workers in the microelectronics and semiconductor field. Last year, EDU partnered with Intel Corporation to help educate and train the Nation's semiconductor manufacturing (and semiconductor manufacturing design) workforce and advance opportunities for equitable STEM education. And as part of this effort, a Dear Colleague Letter announced award opportunities in the ATE program and the Scholarships in Science, Technology, Engineering, and Mathematics (S–STEM) program, programs that build on or leverage strong industry-academic partnerships to strengthen the semiconductor manufacturing workforce.

The ATE program also supports five large ATE Centers with a manufacturing focus:

National Center for Next Generation Manufacturing (NCNGM), based at Tunxis Community-Technical College (CT), which coordinates partnerships involving community colleges, universities, business, industry, and government around the Nation to develop a pipeline of students with the skills to pursue careers in advanced manufacturing during the Fourth Industrial Revolution, known as "Industry 4.0."

National Center for Welding Education and Training (Weld-Ed), based at Lorain County Community College (OH), which has developed curricula and provided professional development for faculty to address the demand for skilled welding technicians, especially technicians who know "lightweighting" welding processes, which are critical in advanced manufacturing and tertiary industries.

Center for Aviation and Automotive Technological Education Using Virtual E-Schools (CA2VES), based at Clemson University (SC), which has developed cutting-edge manufacturing curricula using virtual reality and artificial intelligence e-learning platforms.

Florida Advanced Technological Education (FLATE) Center, hosted by FloridaMakes in Orlando, which offers resources for students, faculty, and industry to support the more than 20,000 companies and 380,000 people who work in manufacturing in the state of Florida.

Minnesota State Advanced Manufacturing Center of Excellence (MSAMCOE), based at Bemidji State University (MN), which has promoted manufacturing careers to K–12 students, developed "digital badges" that recognize students' participation in manufacturing-related experiences, and offered professional development opportunities for educators.

And because U.S. global competitiveness depends on the readiness of the Nation's STEM workforce, this year, NSF published a new Dear Colleague Letter (DCL) that highlights investments in programs that directly support the preparation of this workforce. As part of this effort, this Skills Training in Advanced Research & Technology (START) DCL announces an updated supplemental funding opportunity for the ATE Program and others.

In addition to ATE, this year the agency announced a new program that will accelerate the effect of inclusive and evidence-based practices in undergraduate STEM education at two-year colleges across the country. The IUSE: Innovation in Two-Year College STEM Education program (ITYC) is open to two-year colleges that offer degrees in STEM. A great aspect of this program is that four-year institutions and professional organizations may partner with two-year college that submit proposals.

Moreover, projects funded through ITYC may be in any discipline that is currently supported by NSF funding (and that is a wide range). ITYC differs from ATE a bit as it looks more at the student experience at community colleges and the institutional strengths of the institutions.

Increasing retention and graduation rates at two-year colleges is an ongoing challenge—some of the grand challenges follow students from the schools they came from to the community colleges they go to. The Community College Research Center has found that public community colleges receive less funding than four-year institutions, and the community colleges that serve the most disadvantaged students receive the fewest dollars per student. Additionally, Federal data on completion and graduation rates show that community college students have much lower graduation rates than students at four-year institutions, and data from the National Student Clearinghouse and the Community College Research Center indicate that four out of five students who begin at a community college say they plan to go on to get a bachelor's degree, but only about one in six actually do. That's down by nearly 15 percent since 2020. By adding ITYC to our portfolio, NSF will make greater investments in community colleges. This will open opportunities to graduate from two-year colleges and contribute to the workforce.

Many of NSF's long-standing programs also often partner with and/or support community colleges/students/teachers.

HBCU–UP, for example, is funding a project at Hinds Community College-Utica Community in Mississippi to strengthen the math performance of students who aspire to earn STEM degrees. The overarching goals are to recruit, prepare, develop, and retain African American students who have expressed interest in STEM fields and are at risk for failure in math courses. [Targeted Infusion Project: STEMulating the M in STEM]

And in South Carolina, NSF's Scholarships in Science, Technology, Engineering, and Mathematics Program (S–STEM) is supporting high-achieving, low-income students with demonstrated financial need at Spartanburg Community College, Trident Community College, and Clemson University. The goal is to get students who begin their academic path at community colleges to transfer into engineering and computing degree programs at four-year institutions. [Collaborative Research: Student Pathways in Engineering and Computing for Transfer Success]

Moreover, this summer, NSF partnered with the White House and other Federal agencies to unveil the National Cyber Workforce and Education Strategy, a first-of-its-kind comprehensive approach aimed at addressing both immediate and long-term cyber workforce needs. As part of this initiative, NSF renewed funding for institutions including community colleges, including Sinclair Community College in Ohio, to engage underrepresented student in cybersecurity education. These institutions represent the diversity of NSF investments across geographic and racial demographics, including HBCUs, HSIs, and universities in EPSCoR jurisdictions.

These investments were made through NSF's CyberCorps® Scholarships for Service program which, for decades, has worked to build a strong Federal cybersecurity workforce. In fact, since the first cohort of 31 students in 2001, the CyberCorps® program has supported more than 5,000 students who play critical roles defending our Nation's cyberspace by working at federal, state, tribal, and local government organizations.

CyberCorps® SFS also supports many community colleges through its pathways program. Currently, there are 28 community colleges participating in the CyberCorps Pathways:

Like at Towson University in Maryland, where CyberCorps® SFS is preparing highly qualified cybersecurity professionals with skills such as forensics capabilities in the Federal workforce. CyberCorps® established a pathway between Towson and the Community College of Baltimore County to support students through early mentoring and advising in cybersecurity education. This collaboration provides an opportunity for recruiting students from populations traditionally underrepresented in computing. [CyberCorps: Scholarship for Service at Towson University]

And because transferring community college courses to four-year institutions can often prove difficult, researchers at Old Dominion University in Virginia saw an opportunity through NSF's Secure and Trustworthy Cyberspace (SaTC) program to tackle this problem. This was done by connecting three community colleges within the area with Old Dominion University, creating a formal academic pathway for students to a four-year institution. This prepared students to enter the cybersecurity workforce, and it also increased the diversity of both the cybersecurity student population and potential new employees. [SaTC: EDU: Creating Cybersecurity Pathways Between Community Colleges and Universities] (The three community colleges included: Tidewater Community College, Northern Virginia Community College, and Thomas Nelson Community College)

Question 2. What can Congress do to help Community and Technical colleges strengthen their capacity to train workers in the skills required to succeed in high-growth, high-demand industries?

Answer. Congress can provide continued investment in NSF's programs, like ATE, ITYC, HBCU–UP, CyberCorps, etc.; support career pathway programs from two-year colleges to four-year institutions; stand up for programs at technical colleges that provide education in emerging technologies, like AI, advanced manufacturing. . .; support opportunities for community college teachers (mentorship, professional development, continued education, resource availability, etc.); and understand that NSF alone cannot solve the grand challenges in STEM. It is through collaborations, with industry, other Federal partners, non-profits, community organizations, etc. that we will be able to make the biggest impact. (Working with the field to help itself.)

Question 3. How will a project's economic and social impact, such as workforce development, impact the award amount each project will receive?

Answer. Proposals are submitted in response to program announcements, Dear Colleague Letters, and solicitations, which generally provide the total amounts available and the estimated number of awards for those available funds.

Reviewers evaluate all proposals against two criteria: Intellectual Merit: the potential to advance knowledge; and Broader Impacts: the potential to benefit society and contribute to the achievement of specific, desired societal outcomes.

Administrative Burden on Universities

Question 2. What steps is NSF taking to reduce and minimize the administrative burden on universities of the implementation of the CHIPS and Science Act?

Answer. NSF has historically considered the imposition of administrative burden prior to implementation of new requirements on universities, especially our proposer and awardee community. The following provides illustrative examples of steps NSF is taking or has taken to reduce and minimize the administrative burden associated with universities' implementation of applicable CHIPS and Science Act research security provisions:

- *SEC. 10634. RESEARCH SECURITY TRAINING REQUIREMENT FOR FEDERAL RESEARCH AWARD PERSONNEL.* NSF has co-funded (along with the Department of Energy, the National Institutes of Health, and the Department of Defense) the development of research security training modules. These resources will be made readily available to the U.S. research community, including research universities by the end of January 2024. These four modules will provide fundamental training to the research community and will eliminate the need for individual organizations to develop their own training programs. The four training modules address why research security is important, guidance on disclosure requirements, information on assessing risk, and distinguishing research security concerns from legitimate international cooperation. These modules also will ensure compliance with requirements imposed by the Federal research funding agencies necessary to implement NSPM–33. Note that these training modules also will assist the recipient community in meeting the requirements established in CHIPS and Science Act Section 10337, Responsible conduct in research training.
- *SEC. 10339B. FOREIGN FINANCIAL SUPPORT.* Prior to implementation of Section 10339B in the "NSF Proposal & Policies & Procedures Guide", NSF has been working with professional societies[4] to consider ways to help mitigate the administrative burden associated with this new reporting requirement for foreign financial gifts and contracts received beginning on July 1, 2023, through June 30, 2024. NSF has worked with all stakeholders, including universities, to minimize duplication and respond to questions. The conversations to date have been very productive and will help ensure compliance when the system to collect the relevant required data from Institutions of Higher Education (IHEs) goes into effect in July 2024.
- *SEC. 10632. MALIGN FOREIGN TALENT RECRUITMENT PROGRAM PROHIBITION.* Section 4(b) of National Security Presidential Memorandum-33 (NSPM–33) directs that "research funding agencies shall require the disclosure of information related to potential conflicts of interest and commitment from participants in the Federally funded R&D enterprise . . . The appropriate disclosure requirement varies depending on the individual's role in the United States R&D enterprise." Section 4(b)(vi) directs that "agencies should standardize forms for initial disclosures as well as annual updates, . . . and should

[4] *Represented professional societies include: the Council on Governmental Relations, the Association of American Universities, the American Council on Education, the National Association of Independent Colleges and Universities, and the Association of Public & Land-Grant Universities.*

provide clear instructions to accompany these forms and to minimize any associated administrative burden." NSF led the development of the Biographical Sketch and Current and Pending (Other) Support Common Disclosure Forms and serves as steward of these forms on behalf of OSTP. These common disclosure forms are intended to clarify what is expected of senior/key persons when applying for R&D funding from Federal research funding agencies. As part of the development process, the Section 10632 certification requirement was implemented in each of the Common Forms and ensures that consistent language is used by each Federal research funding agency in implementation of this statutory requirement. This will greatly assist researchers in understanding the requirements associated with this provision in CHIPS and Science. These Common Forms were cleared by the Office of Management and Budget on October 31, 2023.

- *SEC 10338. RESEARCH SECURITY AND INTEGRITY INFORMATION SHARING ANALYSIS ORGANIZATION (RSI–ISAO).* The RSI–ISAO, renamed the Safeguarding the Entire Community in the U.S. Research Ecosystem (SECURE) Center, would empower the U.S. research community (including Institutes of higher education, non-profit research institutions, and small and medium-sized for-profit organizations) to address foreign government interference, and support security-informed decision-making through a variety of information and services.
- *SEC. 10331. OFFICE OF RESEARCH SECURITY AND POLICY.* NSF is working collaboratively with stakeholders to develop a Dear Colleague Letter (DCL) that will focus on supporting research security-related functions and resources within emerging and developing research IHEs. The DCL is exploring specific areas to support, including but not limited to developing a hub concept that would provide shared services to emerging and developing research institutions, which could be replicated nationally.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. PETER WELCH TO DR. SETHURAMAN PANCHANATHAN

To reverse course on climate change, we need to invest in the clean energy technologies of tomorrow. This means the U.S. needs to provide meaningful support to our efficiency and clean energy innovators so they can build strong domestic supply chains for their products. The CHIPS & Science Act established the Directorate of Technology within the National Science Foundation to build a U.S. technology development to commercialization pipeline.

Question 1. Can you describe a success the Directorate has had in the clean energy space thus far?

Answer. The NSF Engines program is already a great example of success. NSF had over 700 concept outlines submitted from all across the country at the start of this process. We were very intentional in how we engaged with the community to encourage teaming and partnerships among potential proposers. We fully expect that this type of engagement and teaming will have a lasting positive impact.

In May of this year, we awarded 44 NSF Engines Development Awards spanning 46 U.S. states and territories. Of those awards, 23 are working on energy technologies—a $23 million investment across 30 states and territories.

NSF Engines will spur use-inspired research that will lead to new technologies or startup companies. We envision this research will drive innovators to engage in the NSF's Lab-to-Market Platform, including applying to programs like the NSF Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) programs.

As one example of success, the NSF SBIR/STTR programs funded Dimensional Energy (NSF–1831166)—a company that uses sunlight to convert carbon dioxide into energy. Its high-light reactor turns carbon dioxide and water into raw materials that could be used to create fuel.

Question 2. What can Congress do to further support the Directorate of Technology's work?

Answer. NSF is grateful for the bipartisan support Congress has shown for our mission in both the CHIPS and Science Act and the FY 2023 appropriations. This support comes at a pivotal time for the United States in terms of international competitiveness and NSF is proud to be a leader in support of our STEM talent and the innovation that will keep us at the vanguard of discovery into the future.

Sustained investments will be necessary for us to fully realize the bold vision outlined in the CHIPS and Science Act.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. TED CRUZ TO
DR. SETHURAMAN PANCHANATHAN

Research Security Guardrails for Fundamental Research

Since 1985, our collaborations in fundamental research with other countries have been completely open, unregulated, and unprotected. For this kind of research, we have put no restrictions on data-sharing or with whom research is done. Of concern, China has been able to leverage the openness of the U.S. research system and acquire technologies and know-how critical to U.S. national security and competitiveness. U.S. researchers on Federal research grants for R&D in cutting edge technologies are concurrently collaborating with China on fundamental research projects.

Question 1. Do you support putting security guardrails around fundamental research, including restrictions on data-sharing?

Answer. NSF is open to a discussion on both guardrails for providing NSF-funding to any entity of concern as well as guardrails and risk mitigations regarding potential collaboration with entities of concern, including data-sharing. In fact, we have several guardrails in place already as described below. It is of utmost importance to make sure that American innovation is safeguarded.

NSF is in the process of implementing a new policy (in the 2024 PAPPG) that will allow NSF to return without review or decline proposals that have the potential to negatively impact research security and integrity due to credible information of a national security concern. This decision-making process will be informed by a risk rubric comprised of risk-based indicators, which is currently under development.

NSF also commissioned a JASON study to help inform NSF's thinking on specific steps that it might take to identify sensitive areas of research, and processes that NSF might use to address security in those research areas of concern. NSF expects the final JASON report by the end of January 2024.

National Science Foundation (NSF) Grant for Journalist Therapy

In September 2022, the NSF began dispersing a $5 million award to the George Washington University to create a therapy toolkit for journalists targeted by "misinformation-driven harassment campaigns."[1]

Question 1. Please explain in detail how this award advances the NSF's statutory mission "to promote the progress of science."

Answer. This project fulfills Section 4(4) of the IOGAN Act. The purpose of the project is to create a system to support journalists and experts who inform the public about topics that are subject to manipulated media. This research also aligns with the guidance Congress gave NSF in the FY 2022 Appropriations, to work across disciplines to counter online influence operations by foreign adversaries by helping individuals who can help counter these operations when they are subsequently attacked for doing so.

NSF Engagement in Censorship Projects

During your testimony, you made the following statement: "I want to say one thing very categorically, we do not—NSF does not engage in censorship. We do not regulate any content and engage with anybody who also does so." You then stated: "We are not in the business of censorship. We are not in the business of controlling content." However, a cursory examination of NSF grants directly contradicts your claim that NSF does not engage with anybody who regulates content. For example, since Fiscal Year 2021, NSF has funded over 100 academic projects that are aimed at supposedly reducing "mis-, dis-, and mal-information," much of which is simply content that the progressive left does not agree with.

1. Define "censorship."
2. Define "regulate [. . .] content."
3. Define "controlling content."
4. Define "engage" in the context of your statement above.
5. Define "in the business of" in the context of your statement above.

Answer. As part of the agency's mission and, as requested by Congress as described in the response below, the National Science Foundation enables the Nation's scientists to study the flow of information. That may happen by studying how computer networks affect the spread of information, or it may be by studying how users of those networks interact with the network or with each other. NSF's interests lie

[1] *See* USA Spending, NSF, *https://www.usaspending.gov/award/ASST_NON_2230683_4900*

in the underlying technological and foundational computer science and sociological questions that can inform users, industries, regulators, and Congress in this space.

NSF Grants with First Amendment Implications

Answer. These awards are made pursuant to sections 3 and 11 of the National Science Foundation (NSF) Act of 1950. Under those authorities, "The Foundation is authorized and directed—(1) to initiate and support basic scientific research and programs to strengthen scientific research potential and science education programs at all levels in the mathematical, physical, medical, biological, social, and other sciences, and to initiate and support research fundamental to the engineering process and programs to strengthen engineering research potential and engineering education programs at all levels in the various fields of engineering, by making contracts or other arrangements (including grants, loans, and other forms of assistance) to support such scientific, engineering, and educational activities and to appraise the impact of research upon industrial development and upon the general welfare;" and "(8) to take a leading role in fostering and supporting research and education activities to improve the security of networked information systems." (42 USC 1862(a)). To carry out those activities the Foundation is authorized "to enter into contracts or other arrangements, or modifications thereof, for the carrying on, by organizations or individuals in the United States. . .of such scientific or engineering activities as the Foundation deems necessary to carry out the purposes of" the NSF Act of 1950. (42 USC 1870(c)).

The awards described below are representative of the ways that the National Science Foundation enables the Nation's scientists to study the flow of information. That may happen by studying how computer networks affect the spread of information, or it may be by studying how users of those networks interact with the network or with each other. Given how prevalent the use of social media is in American society it is important that NSF enable our Nation's scientists to add to our common understanding of how and why those networks work. This includes studying how false or misleading information is spread among those networks.

These awards are also consistent with Congressional explanatory text accompanying the final appropriations for Fiscal Years 2021 and 2022 which stated that "NSF is encouraged to consider additional research efforts that will help counter influence from foreign adversaries on the Internet and social media platforms designed to influence U.S. perspectives, sow discord during times of pandemic and other emergencies, and undermine confidence in U.S. elections and institutions" (166 Cong. Rec. H7947 (2020) (Explanatory Statement accompanying the Consolidated Appropriations Act, 2021); H. Comm Print 47–047, Legislative Text and Explanatory Statement, Book 1, at 303 (2022) (Explanatory Statement accompanying the Consolidated Appropriations Act, 2022)).

NSF does not endorse any outcomes from funded research, and in fact explicitly disclaims the final Project Outcome Reports for the General Public as written and presented by the researcher(s), using the following text from NSF's Proposal & Award Policies & Procedures Guide (PAPPG):

"This Project Outcomes Report for the General Public is displayed verbatim as submitted by the Principal Investigator (PI) for this award. Any opinions, findings, and conclusions or recommendations expressed in this Report are those of the PI and do not necessarily reflect the views of the National Science Foundation; NSF has not approved or endorsed its content."

(PAPPG at VII.D.3.) As such, funding these projects does not abridge the First Amendment's guarantee of freedom of speech.

The above referenced statute and explanation pertain to each award listed below. In addition, an explanation of the purpose of each award is provided.

For each of the following awards, please provide the section of NSF's statutory mandate that the award fulfills and a "yes" or "no" answer as to whether NSF believes the awarding of government funds for the project is consistent with the First Amendment. For awards to which you answered "yes," please provide any documentation or analysis NSF conducted to verify that the project would not infringe on lawful speech. For awards to which you answered "no," indicate whether you will reevaluate and possibly rescind the award.

For responses:

1. $5 million ongoing award to the University of Washington.

a. "[S]olutions must not only provide the public with skills for determining the truthfulness of claims, but must also provide resources for addressing the social and emotional impacts of misinformation. [This project] will also design

and implement a socio-technical platform that supports digital literacy interventionists."[2]

Answer. This project fulfills Section 4(4) of the IOGAN Act. The purpose of the project is to educate the public to understand and process online information. The project focuses on co-designing culturally relevant digital literacy training with black and rural communities, as well as community colleges. This research also aligns with the guidance Congress gave NSF in the FY 2022 Appropriations, *i.e.,* to work across disciplines to counter online influence operations by foreign adversaries by helping to create a more informed public with better skills to understand these operations.

2. $5 million ongoing award to the University of Wisconsin.

a. "[T]his project is a dynamic and flexible digital dashboard that will help end users . . . (1) identify trending misinformation networks on social media platforms . . . (2) strategically correct misinformation." "[B]y the end of phase II, Course Correct intends to have further developed the digital dashboard in ways that could ultimately be adopted by other end users such as *public health organizations, election administration officials* (emphasis added), and commercial outlets."[3]

Answer. This project fulfills Section 4(4) of the IOGAN Act. The purpose of the project is to create a system to identify emerging narratives based on unverified information and surface them to journalists, who can then decide whether or not to write stories about those narratives. This research also aligns with the guidance Congress gave NSF in the FY 2022 Appropriations, to work across disciplines to counter online influence operations by foreign adversaries, by identifying them and surfacing them to journalists who can inform the public about them.

3. $5 million ongoing award to the George Washington University.

a. "[T]his project addresses the links between two significant problems impacting trust in contemporary communication systems: (1) the broad and rapid spread of misinformation and (2) abuse and harassment directed at members of expert communities" and "create[s] a rapid-response socio-technical system that supports journalists and other experts facing online abuse and harassment."[4]

Answer. This project fulfills Section 4(4) of the IOGAN Act. The purpose of the project is to create a system to support journalists and experts who inform the public about topics that are subject to manipulated media. This research also aligns with the guidance Congress gave NSF in the FY 2022 Appropriations, to work across disciplines to counter online influence operations by foreign adversaries by helping individuals who can help counter these operations when they are subsequently attacked for doing so.

4. $505,017 ongoing award to the State University of New York.

a. "[T]his project aims to address these challenges by transitioning a set of algorithms, software frameworks, and system designs out of the research lab into the hands of active practitioners to help identify and mitigate information manipulation (misinformation and dis-information)."[5]

Answer. The purpose of this award is to ensure the stability of the information ecosystem and educate future practitioners about fundamental software development skills in the areas of systems, machine learning, and data science. The project aims to design and develop a production capable, open-source software suite to enable the rapid collection, management, and analysis of social media data.

5. $441,200 ongoing award to the University of Utah.

a. "[T]o address these challenges, this project combines the complementary information processing strengths of humans and computation to transform the efficiency, effectiveness, and scale of fact-checking. The project can enable fact-checkers to spot misinformation early, prioritize effort, and unify the various tools and techniques used for fact-checking."[6]

Answer. The purpose of this award is to scale the work of human fact-checkers and boost information literacy in society. The project aims to use elements of security incident response (*i.e.,* preparation, detection, containment, and post-incident activity) to transform the ad-hoc, time-consuming, and small-scale nature of current fact-checking practices.

6. $396,000 ongoing award to New York University.

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[2] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2230616_4900*
[3] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2230692_4900*
[4] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2230683_4900*
[5] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2247867_4900*
[6] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2154123_4900*

a. "[T]o address these challenges, this project combines the complementary information processing strengths of humans and computation to transform the efficiency, effectiveness, and scale of fact-checking. The project can enable fact-checkers to spot misinformation early, prioritize effort, and unify the various tools and techniques used for fact-checking." [7]

Answer. The purpose of this award is to scale the work of human fact-checkers and boost information literacy in society. The project aims to use elements of security incident response (*i.e.,* preparation, detection, containment, and post-incident activity) to transform the ad-hoc, time-consuming, and small-scale nature of current fact-checking practices.

7. $336,664 ongoing award to Rensselaer Polytechnic Institute.

a. "[U]nderstanding how information flows and its impact on human behavior is important for determining how to protect society from the effects of misinformation, propaganda, and "fake news". This project traces how information spreads on social media channels and how ideas, opinions, and beliefs change as they spread." [8]

Answer. The purpose of this award is to study how information flows on social media, to better understand how online social networks, with a high degree of public participation, shape public opinion. The project aims to develop a computational model of the information flow in social media that contrast with traditional news sources.

8. $330,555 ongoing award to the University of Florida.

a. "[D]espite decades of research, misinformation remains a serious threat as most technical mitigation methods focus on improving detection accuracy and fail to consider social and emotional perspectives. This project assists in enhancing information integrity by identifying influencing communities, agents, and culturally resonant information to identify tipping points in public dialogue on controversial issues and offering venues of user-centric interventions at scale." [9]

Answer. The purpose of this award is to move away from source-centric accuracy detection and debunking to focus on user-centric interventions. The project aims to develop novel deep learning models based on topology ML, which effectively predict heterogeneous social norm emergence for timely intervention, identify top trusted features for engagement, and temporal explainable artificial intelligence for transparent interaction with users.

9. $225,669 ongoing award to Boston University.

a. "[T]his project aims to address these challenges by transitioning a set of algorithms, software frameworks, and system designs out of the research lab into the hands of active practitioners to help identify and mitigate information manipulation (misinformation and dis-information)." [10]

Answer. The purpose of this award is to move away from source-centric accuracy detection and debunking to focus on user-centric interventions. The project aims to develop novel deep learning models based on topology ML, which effectively predict heterogeneous social norm emergence for timely intervention, identify top trusted features for engagement, and temporal explainable artificial intelligence for transparent interaction with users.

10. $224,033 ongoing award to the Illinois Institute of Technology.

a. "[T]he project aims to study the scientific underpinnings of disinformation and develop a computational framework to attribute, detect, and explain disinformation to inform policymaking." [11]

Answer. The purpose of this award is to systematically investigate major data, provenance and explainability challenges in disinformation analysis. The project aims to develop new computational methods for multi-modal disinformation detection models that include images and social contexts, and for explainable disinformation detection models via the guidance of well-established social theories.

11. $220,000 ongoing award to Syracuse University.

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[7] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2154119_4900*
[8] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2214216_4900*
[9] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2323794_4900*
[10] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2247868_4900*
[11] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2241068_4900*

a. "[T]he project aims to study the scientific underpinnings of disinformation and develop a computational framework to attribute, detect, and explain disinformation to inform policymaking." [12]

Answer. The purpose of this award is to systematically investigate major data, provenance and explainability challenges in disinformation analysis. The project aims to develop new computational methods for multi-modal disinformation detection models that include images and social contexts, and for explainable disinformation detection models via the guidance of well-established social theories.

12. $217,000 ongoing award to the University of North Carolina at Charlotte.

a. "[D]espite decades of research, misinformation remains a serious threat as most technical mitigation methods focus on improving detection accuracy and fail to consider social and emotional perspectives. This project assists in enhancing information integrity by identifying influencing communities, agents, and culturally resonant information to identify tipping points in public dialogue on controversial issues and offering venues of user-centric interventions at scale." [13]

Answer. The purpose of this award is to move away from source-centric accuracy detection and debunking to focus on user-centric interventions. The project aims to develop novel deep learning models based on topology Machine Learning that effectively predict heterogeneous social norm emergence for timely intervention, identify top trusted features for engagement, and temporal explainable artificial intelligence for transparent interaction with users.

13. $120,008 ongoing award to the Georgia Tech Research Corporation.

a. "[T]he general approach is to leverage the social responses that ordinary users make on online posts, such as supporting, questioning, disbelieving, or countering claims, to robustly detect misinformation and suggest corrective responses." [14]

Answer. The purpose of this award is to help everyday users effectively assess and respond to non-credible information. The project aims to build robust detection models that leverage graph neural networks, adversarial learning, and social network analysis.

14. $155,967 ongoing award to the University of California, Santa Barbara.

a. "[T]he project aims to study the scientific underpinnings of disinformation and develop a computational framework to attribute, detect, and explain disinformation to inform policymaking." [15]

Answer. The purpose of this award is to systematically investigate major data, provenance and explainability challenges in disinformation analysis. The project aims to develop new computational methods for multi-modal disinformation detection models that include images and social contexts, and for explainable disinformation detection models via the guidance of well-established social theories.

15. $67,380 ongoing award to the Pennsylvania State University.

a. "[T]he experience of the COVID–19 pandemic has highlighted the need to develop strong relationships and trust between the research community and these various constituencies before a crisis. The workshop will be organized around 3 sessions: 1) case studies of innovation and misinformation in focal pathogens and "gain of function" research, 2) communicating novelty and risk, 3) tailoring communication to different audiences . . . including lay public, agency, and policymakers." [16]

Answer. The purpose of this award is to teach graduate students and early career scientists' skills in communicating routine scientific advancements, specifically surrounding the microbiome in relation to health and food security. The workshop will include sessions on communication theory and practice, addressing misinformation, and communicating with a diverse audience.

16. $38,515 ongoing award to the University of Houston.

a. "[T[his . . . project is the development of an online dashboard with misinformation forecast trends and analysis to help address the misinformation endemic in America." [17]

Answer. This is an I-Corps Teams award, which is an award to support participation in an NSF entrepreneurial training program called the NSF Innovation Corps,

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[12] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2241070_4900*
[13] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2323795_4900*
[14] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2239879_4900*
[15] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2241069_4900*
[16] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2319012_4900*
[17] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2309846_4900*

or NSF I-Corps™, program. The funding does not support technical research but provides tools and knowledge to researchers in science and engineering fields to allow evaluation of the commercial potential of their technology. The PI, her students, and an industry mentor participated in the training program in the spring of 2022.

This project fulfills Section 601 of the American Innovation and Competitiveness Act of 2017, which authorizes the NSF I-Corps program, and Sections 1 and 2 of the IOGAN Act. As noted above, the purpose of the project is to provide entrepreneurial education to a team of researchers interested in evaluating the commercial potential of their technology. Specifically, this I-Corps project is based on prior research on the development of automated data collection, data analytics, and deep learning methodologies with the goal of creating an application and associated website that centralizes up-to-date misinformation content and metrics. This research is responsive to Sections 1 and 2 of the IOGAN Act in that it is developing tools and technologies for authenticating information and detection of manipulated or synthesized content online. In addition, the prior research aligns with guidance Congress gave to NSF in the FY 2022 Appropriations, which is to "help counter influence from foreign adversaries on the Internet and social media platforms designed to influence U.S. perspectives, sow discord during times of pandemic and other emergencies, and undermine confidence in U.S. elections and institutions."

17. $21,003 ongoing award to the University of Alaska, Fairbanks.

a. "[T]hough a small body of prior research on health misinformation exists, there is a pressing need to gain a better understanding of how to detect, monitor and understand misinformation and its impact on population health during emergencies. The project takes a one health approach, documenting perspectives of public health officials and healthcare providers on misinformation." [18]

Answer. This award supports a dissertation project exploring the role of misinformation in Alaska's response to the covid pandemic. As part of the emerging field of infodemiology, this project investigates the impacts of misinformation on public and individual health through interviews with health care providers and public health personnel.

18. $16,014 ongoing award to the University of Oklahoma.

a. "[T]he development of a software platform that may be integrated into crisis management systems such as public health (WHO, CDC), emergency management (FEMA), and transportation (DOT) agencies to facilitate the transmission of correct information and provide the option to notify social media providers of identified misinformation" (emphasis added). "It is becoming increasingly important for government agencies, policy makers, and emergency management officials to be capable of addressing major crisis scenarios under acute time and resource constraints. Using social media platforms more efficiently would be a critical step towards this vision." [19]

Answer. This is an I-Corps Teams award, which is an award to support participation in an NSF entrepreneurial training program called the NSF Innovation Corps, or NSF I-Corps™, program. The funding does not support technical research but provides tools and knowledge to researchers in science and engineering fields to allow evaluation of the commercial potential of their technology. The PI, his student, and an industry mentor participated in the training program in the winter of 2021.

This project fulfills Section 601 of the American Innovation and Competitiveness Act of 2017, which authorizes the NSF I-Corps program, and Sections 1, 2, and 5 of the IOGAN Act. As noted above, the purpose of the project is to provide entrepreneurial education to a team of researchers interested in evaluating the commercial potential of their technology. Specifically, this I-Corps project is based on prior research on the development of a software platform that may be integrated into crisis management systems such as public health (WHO, CDC), emergency management (FEMA), and transportation (DOT) agencies to facilitate the transmission of correct information and provide the option to notify social media providers of identified misinformation. This research is responsive to Sections 1, 2, and 5 of the IOGAN Act in that it is developing tools and technologies for authenticating information and detection of manipulated or synthesized content online (Sections 1 and 2); and coordinated with other Federal agencies and programs (Section 5). In addition, this prior research aligns with guidance Congress gave to NSF in the FY 2022 Appropriations, which is to "help counter influence from foreign adversaries on the Internet and social media platforms designed to influence U.S. perspectives, sow discord during

[18] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2309906_4900*
[19] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2222940_4900*

times of pandemic and other emergencies, and undermine confidence in U.S. elections and institutions."

19. $11,485 completed award to Texas State University.

a. "[T]his . . . project is the development of an online dashboard with misinformation forecast trends and analysis to help address the misinformation endemic in America."[20]

Answer. Please note that this I-Corps award is the same as number 16 above. The original award was made to Texas State University under PI Zhijie (Sasha) Dong. I-Corps Award 2223343 was the original award and 2309846 is a PI Transfer Award to the University of Houston.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. JERRY MORAN TO DR. SETHURAMAN PANCHANATHAN

Geographic Diversity of Research and Innovation Funding

A major theme of the CHIPS and Science Act was the need to increase Federal research and development funding. In particular, NSF was singled out to increase the percentage of spending from key research accounts that goes to historically underfunded states. Provisions to ensure geographic diversity were also included in key Commerce programs included in the CHIPS and Science Act.

Question 1. You mention in your written testimony that the Foundation has slightly exceeded the 15.5 percent FY2023 funding allocation goal for EPSCoR states. What challenges, if any, does the Foundation face in meeting or exceeding these goals in future years?

Answer. NSF is dedicated to meeting and exceeding these goals in future years. The primary challenge to doing so is receiving an increase in meritorious proposal submissions from EPSCoR jurisdictions to facilitate the increasing investment rates. To mitigate this challenge, NSF's EPSCoR and GRANTED programs are designed to support EPSCoR jurisdictions in building their research capacity, resulting in pathways to sustainability and research funding support as well as support with the proposal preparation and award management processes.

Workforce Challenges for High-Demand Fields

Question 1. How is the Foundation working to ensure that our Nation can recruit, educate, and retain the world's brightest minds that will move our technology-driven economy forward through advancement in AI, quantum computing, and other key technologies?

Answer. The NSF Research Traineeship (NRT) Program explores model pathways for graduate students in research-based master's and doctoral degree programs to develop the skills, knowledge, and competencies needed to pursue a range of STEM careers. The program is especially focused on effective training of STEM graduate students in high priority interdisciplinary or convergent research areas, through a comprehensive traineeship model that is innovative, evidence-based, and aligned with changing workforce and research needs. The program has called out Artificial Intelligence and Quantum Information Science and Engineering as priority areas since 2020 (see NSF 21–536). Also, a recent NSF news item highlights recent NRT investments in ethical AI: *https://new.nsf.gov/funding/initiatives/nrt/advancing-ethical-ai-through-convergent-research.*

For example, at Kansas State University, researchers are directing a project, "Preparing Future Leaders: Rural Resource Resiliency," which trains students to become science-based leaders and advocates for resilient rural communities by combining engineering, economics, and sociological knowledge to meet the needs of farmers, industry, and society. Students engage with farmers, government and industry through interactive sessions and develop relevant skills through innovative coursework and teamwork. This comprehensive program anticipates training fifty (50) master's and doctoral students, including twenty-five (25) funded trainees, from the colleges of engineering, arts and sciences, and agriculture.

Another team of researchers at the University of New Mexico is leading "Quantum Photonics Interdisciplinary Training to Advance Quantum Technologies (QPAQT)," which is addressing the need for cross-disciplinary graduate training in quantum photonics for students with diverse undergraduate backgrounds. The program anticipates preparing 175 students, including 25 funded trainees, to become generalists in quantum technologies hardware. The tools and academic training pro-

[20] *See* USASpending, *NSF, https://www.usaspending.gov/award/ASST_NON_2223343_4900*

vided will prepare trainees for a wide variety of careers in semiconductor and quantum technologies.

Since 2019, the NRT program has funded 15 AI awards/projects. An additional 10 awards/projects also incorporate aspects of AI in their training. During this same period the program has funded 12 awards related to quantum science/computing.

NSF has developed an expansive and inclusive range of workforce development programs, broadly supporting science and engineering, including learners in K–12 schools, community colleges, and universities, as well as reskilling for current workers and upskilling for those seeking to enter the workforce in new and emerging areas. Below are some examples of these programs. Importantly, these programs do not represent an exhaustive list of NSF-funded workforce development programs, but instead a sampling especially well aligned with key technology focus areas.

Advanced Technological Education (ATE)—invests in advanced technician training supporting nearly 40,000 students and 9,000 teachers annually.

NSF Scholarships in Science, Technology, Engineering, and Mathematics (S–STEM)—provides scholarships for low-income, academically talented students and has supported more than 100,000 students across the Nation since 2006.

Experiential Learning for Emerging and Novel Technologies (ExLENT)—provides practical experiences in emerging technologies and will support hundreds of students in 2023.

Non-Academic Research Internships for Graduate Students (INTERN)—supports more than 300 NSF-funded graduate students each year to provide experiential opportunities to prepare students for careers in industry and other non-academic environments.

Research Experiences for Undergraduates (REU)—supports more than 6,000 students each year to conduct intensive, semi-independent research projects, mentored by faculty and other experienced STEM professionals.

CSGrad4US Fellowships, eFellows, and *MPS-Ascend*—seek to increase the number and diversity of students engaging in advanced degree programs and post-doctoral experiences. CSGrad4US fellowships focus on graduate students. MPS-Ascend and eFellows focus on post-doctoral researchers.

Supplements for Semiconductor Fabrication and Prototyping—provides NSF-funded researchers and educators funding to expand researcher and student access to semiconductor fabrication experiences. These opportunities can be viewed as a scalable crosscut across the programs listed above, and others.

NSF Entrepreneurial Fellowships—provide up to two years of support to Ph.D.-trained scientists and engineers from a variety of backgrounds and regions across the U.S. with stipends plus access to specialized research facilities and equipment to advance their prototypes, refine their business models, build their teams, and secure follow-on money.

NSF and its current partners are investing more than $350 million annually in the above programs.

NSF also invests in capacity-building at institutions of higher education in key technology focus areas:

ExpandAI—This program supports capacity-development projects and partnerships within the National AI Research Institutes ecosystem that help broaden participation in artificial intelligence research, education and workforce development.

ExpandQISE—This program supports research and training that will lead to scientific and engineering breakthroughs in quantum information science and engineering, while broadening participation and securing a talent pipeline matched to the needs of this emerging field.

The above constitutes a sampling of our educational offerings.

Computational Power

Question 1. Given the tremendous computational capacity that has developed in the private sector, in part thanks to Federal basic research investments, does it make more sense to provide support for academic and government scientists to have access to cloud compute resources, rather than building new supercomputers and expanding Federal hardware assets?

Answer. NSF provides the research community with access to the computational and data systems that are best suited for their diverse domains of research and which allow the broad research community to maximize its scientific output. For the foreseeable future, this will require a combination of diverse agency-supported on-site large-scale systems and support for access to commercial cloud resources. There are two reasons for this. First, agency-supported computing resources are optimized and operated specifically for scientific use, leading to high scientific productivity. Second, the present demand for GPUs, the dominant technology used for AI com-

putations, is immense and commercial cloud prices are high and can be considerably more expensive than our on-site supercomputing centers.

NSF provides tens of thousands of researchers access to advanced computational, AI and data systems at university-based high-performance computing centers and sites distributed across the Nation. These resources provide not only compute cycles to researchers, but also provide the Nation a reservoir and training ground for critical skillsets needed for national leadership in computing including the know-how, expertise, and ability to touch and configure hardware, software, and networking systems for research purposes. The academic institution-based computing centers that house the largest NSF-supported computational systems are research and development laboratories on their own. These centers support novel uses of cyberinfrastructure, co-designing experiments such as the collaboration between San Diego Supercomputing Center and the WIFIRE project that investigates using digital sensors to detect wildfires and aid human decision making in interventions. These high-performance computing sites also provide a community for computational researchers nationwide to get help with code optimization and debugging, provide trainings and education for students and new users, and provide a clearing house for best practices learned in different computational domains. Providing access to computational systems is only one aspect necessary to effectively conduct computational research. We are investigating how these critical community capabilities would need to be adapted with a growing use of the commercial cloud for research.

NSF recognizes the growing role of the commercial cloud in the computing ecosystem and notes that there are new technologies, only available in the commercial cloud, to which NSF-supported researchers must have access. NSF supports commercial cloud usage through awarded grants, and, more recently, NSF awarded a pilot program CloudBank, which is a cloud access entity that helps the NSF research community access and use public clouds for research and education by delivering a set of managed services designed to simplify access to public clouds. CloudBank is now supporting 250 projects using the commercial cloud and is providing critical lessons learned and insights as NSF considers the rapidly growing capabilities in the commercial cloud.

The high-end computing and commercial cloud market are currently undergoing rapid disruption. Companies that historically had supported on-site supercomputing deployments are entering the cloud computing market and cloud companies are now deploying their cloud-based systems on-site at customer locations. Many of the techniques to manage and run on-site and cloud-based systems are merging. NSF is closely tracking these developments and their implications for the research community.

Finally, as part of the National AI Research Resource (NAIRR) Pilot, NSF will be partnering closely with both on-site supercomputing centers as well as commercial cloud providers to demonstrate the value and impact of the NAIRR concept. Through these partnerships we will gain invaluable experience that will shape the direction of how the research community accesses a variety of computational and data resources.

Quantum Computing

Question 1 Are we at the point with Quantum computing that NSF or NIST or another Federal agency should be developing metrics to determine efficacy and efficiency of quantum computations?

Answer. Having an established set of benchmarks will be essential to track progress and enable performance comparisons of quantum computing systems. However, the field of quantum computing is currently advancing so rapidly that it is not yet clear what measures will be most appropriate. Because of their proximity to the latest scientific and technology developments, the research community driving these advances is currently in the best position to explore these common benchmarks. That community includes researchers funded by NSF, industry, and other government agencies. Possible avenues for initial coordination on benchmarks could include the National Quantum Coordination Office (NQCO), the NQI Advisory Committee, and the non-governmental Quantum Economic Development Consortium.

Workforce Challenges for Domestic Superconducting Ecosystem

Question 1. What are the workforce shortfalls in establishing a viable domestic superconducting ecosystem and how is NSF working to address this need?

Answer. NSF has several programs that address both fundamental science and workforce shortfalls to advance a vibrant domestic superconducting ecosystem. The main programs that contribute and support advancing fundamental science as well as workforce capacity development across the workforce spectrum in the superconductor space are: the Condensed Matter Physics (CMP) and Condensed Matter

and Materials Theory (CMMT) Programs, Designing Materials to Revolutionize and Engineer our Future (DMREF) Program, Materials Research Science and Engineering Centers (MRSEC) Program, Partnerships for Research and Education in Materials (PREM) Program, and National High-Magnetic Field Laboratory (NHMFL) national facility.

DOC and NSF Coordination—

Question 1. In light of the MOU announced on July 26 to improve coordination between EDA and NSF on the Tech Hubs and NSF Engines programs, what specific steps are NSF and DOC taking to avoid duplication between these two programs?

Answer. NSF and EDA are closely collaborating on our investments through the NSF Engines and EDA Tech Hubs programs. For example, NSF program staff were engaged by EDA in the review of their Tech Hubs proposals, and vice-versa. NSF and EDA have shared information about proposals and prospective awards. And NSF and EDA are sharing knowledge and best practices on evaluation and assessment at the project and program levels.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. DAN SULLIVAN TO DR. SETHURAMAN PANCHANATHAN

The CHIPS Act provides the National Science Foundation several prominent roles, including fostering U.S. growth and research in 10 key technology focus areas. One of those areas is "advanced energy and industrial efficiency technologies".

Helpfully this term is already defined in statute: "advanced energy technologies" are defined as technologies that "enhance the energy independence and security of the United States by enabling improved or expanded supply and production of domestic energy resources, *including coal, oil, and natural gas."* (42 USC 18632, the Dept. of Energy Research and Innovation Act (2018)).

In February 2023, I—along with Senators Wicker, Cornyn, and Young—wrote to you and emphasized this definition. We urged you to follow congressional intent and include fossil fuel energy technologies in NSF's focus areas in addition to renewables. Unfortunately, your response to our letter skirted the issue and instead reiterated that "our Nation's future depends on winning the research, innovation, translation, and education race to transform the energy sector."

America's abundant energy resources are crucial to our economy and national security, especially given the current geopolitical climate. A speedy and faithful implementation of the CHIPS Act—including fostering advanced energy technologies like coal, oil, and natural gas—will go a long way toward enhancing the energy independence and security of the United States.

Question 1. Will you clearly state whether the NSF will foster U.S. growth and research in advanced energy technologies, including coal, oil, and natural gas, in accordance with congressional intent?

Question 2. Will you commit to have the NSF be neutral to energy source when fostering advanced energy technologies?

Answer to 1 & 2. NSF remains committed, via its merit review process, to supporting energy technology investments that support high-risk, high-reward research ideas across the science and engineering spectrum that create broad new understanding and enable future innovations.

The CHIPS Act requires the Director of the NSF to address five "societal, national, and geostrategic challenges" to "guide [NSF's] activities," including "climate change and environmental sustainability" and "inequitable access to education, opportunity, or other services." This provision seemingly gives you substantial discretion to insert these "societal" and "climate" challenges into the NSF's work.

Question 1. Can you commit that you will not use any of these challenges including "climate change and environmental sustainability" to curtail research and innovation in oil and gas?

Answer. Through its merit review process, the National Science Foundation (NSF) ensures that proposals submitted are reviewed in a fair, competitive, transparent, and in-depth manner. Merit review remains at the heart of NSF's enterprise. It identifies portfolios of ideas for funding in accord with two merit review criteria—Intellectual Merit (IM) and Broader Impacts (BI). NSF's merit review process remains the gold standard in the allocation of the agency's annual resources to support U.S. basic scientific research and programs to strengthen scientific research potential and science education programs at all levels throughout the United States and worldwide. Our goal is to fund awards with integrity in a fair, competitive, and transparent process. NSF's mechanisms for assessing merit review includes the uti-

lization of external advisory committees, reports from Committees of Visitors (COVs), and biennial surveys of proposers and reviewers.

The United States is currently the world-leader in AI development, deployment, and innovation, but during a committee hearing last month on transparency in Artificial Intelligence, witnesses explained that other nations are "working harder than ever to develop the next major technological developments in AI. . ."

The thought of losing our lead in AI development raises a number of alarm bells for my colleagues and I, particularly if our lead is lost to an adversarial power like China. In briefings and roundtables that Congress has had on this topic, it has been estimated that China is somewhere between one-and-a-half to two years behind us in AI capabilities, however the recent explosion in popularity of generative AI has renewed their focus on this race. In fact, this summer the Chinese began working on the development of their own lithography machines for printing the high-tech chips needed for AI computing.

Question 1. What role does the CHIPS Act, and the Department of Commerce more broadly, have in maintaining U.S. superiority in AI development?

Answer. The CHIPS and Science Act laid out a roadmap for addressing the intense global competition for leadership in the technologies of today like AI and for seeding the industries of tomorrow. NSF is one of the largest non-defense investor in AI research in the Federal government, and the CHIPS and Science act proposed greatly increasing NSF's ability to invest in innovative ideas through the Regional Innovation Engines and other programs. However, without appropriations at the President's Budget Request level, we risk allowing our competitors to capitalize on innovations we do not invest in.

Question 2. Do you see any logical supply chain or computing power chokepoints relevant to the Department of Commerce that could be used to slow down China's development of AI technology?

Answer. NSF defers to the Department of Commerce.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. MARSHA BLACKBURN TO DR. SETHURAMAN PANCHANATHAN

Question 1. How are you coordinating your activities with the national laboratories? What are the potential areas for collaboration with the national laboratories?

Answer. In January of this year, NSF and DOE's Office of Science signed a memorandum of understanding that will enable increased partnerships to address some of our most important challenges. This MOU builds upon previous partnerships and provides opportunities for collaboration on biotechnology, quantum, advanced manufacturing, engineering, artificial intelligence and machine learning.

NSF and DOE's robust partnership includes access to various NSF- and DOE-managed multi-user facilities around the globe. One recent success from that partnership is the NSF-supported work of researchers at the University of South Carolina who collaborated with the DOE's Sandia National Laboratories. The researchers have created a new type of porous material with unique nanoscale properties that can potentially enable superior hydrogen storage solutions—an innovation that would be useful for fuel cells used in vehicles, backup power supplies and other applications.

The NSF and DOE work together on many important projects, including the National High Magnetic Field Laboratory (NHMFL). The NHMFL is the largest and most powerful magnet facility in the world, and it is used by scientists from all over the globe to conduct research in a wide range of fields. The NSF supported NHMFL is located at three different sites: Florida State University, the University of Florida, and the DOE Los Alamos National Laboratory (LANL). Each site has its own unique capabilities, and together they work to advance our understanding of high magnetic fields and their applications, which may lead to the technologies and scientific solutions of tomorrow.

An additional success from this partnership is an NSF-DOE-supported award for Accelerating Innovations in Biomanufacturing Approaches through Collaboration Between NSF and the DOE BETO funded Agile BioFoundry, a consortium of national laboratories dedicated to accelerating biomanufacturing and decarbonizing the economy.

University of Georgia researchers and DOE's Agile BioFoundry will work to increase understanding of the metabolic pathways that allow a novel microorganism to produce hexanoic acid, that can be engineered to create sustainable aviation fuel among a host of other carbon neutral products.

Another example of the NSF–DOE partnership is the newly awarded Synchrotron for Earth and Environmental Science (SEES) facility to the University of Chicago.

SEES provides researchers access to a suite of analytical instrument capabilities at synchrotron beam sources across the country, including Argonne National Laboratory, Lawrence Berkely National Laboratory, Brookhaven National Laboratory and SLAC National Accelerator Laboratory. The facility enables a range of research from critical mineral formation to natural hazards mediation to future technological advancements and human health.

Question 2. Team TN recently secured an NSF Regional Innovation Engines Development award for Advancing Technology-Enabled Mobility Solutions.

a. Please tell me how NSF will support open innovation platforms and testbeds?

Answer. The CHIPS and Science Act authorized TIP to establish a program supporting Test Beds. This program will support the development, operation, integration, deployment, and demonstration of new, innovative critical technologies for users from academia and industry. A test bed could include hardware or software, or both, and would provide broad access to a wide range of users. One key goal is to increase participation by populations that are underrepresented in STEM. Another key goal is to encourage participation by innovators and entrepreneurs and the development of new businesses.

TIP has already initiated one test beds program, the *National Quantum Virtual Laboratory (NQVL),* in the key technology focus area of quantum information science. Subject to future appropriations, TIP will expand the test beds opportunity to encompass additional key technology areas.

b. How will the NSF help accelerate tech transfer to industry to promote entrepreneurship?

Answer. NSF has a range of programs that serve to accelerate technology translation from the lab to the market and society. For example, upon its inception, TIP brought together NSF's Lab-to-Market program, spanning:

- Partnerships for Innovation (PFI), which provides NSF-funded researchers the opportunity to increase the impact of their discoveries by teaching researchers how to develop and implement a technology roadmap, create a business model, and develop their technology into a prototype or proof of concept;
- NSF Innovation Corps (NSF I-Corps™), which experiential entrepreneurial education to further the Nation's innovation ecosystem; I-Corps connects the technological, entrepreneurial and business communities—addressing skill and knowledge gaps to reduce the time it takes to bring technologies from the lab to the marketplace; and
- NSF Small Business Innovation Research/Small Business Technology Transfer (SBIR/STTR) programs, which invest in hundreds of early-stage startups annually, transforming scientific discovery into products and services with commercial and societal impact. America's Seed Fund, powered by NSF, supports startups and small businesses working across almost all areas of science and technology. Each company can receive up to $2 million to support research and development.

Additionally, NSF is expanding into other technology translation pathways, such as open-source ecosystems.

Question 3. Please tell me how you will prioritize EDA Tech Hub partnerships to produce faster routes from research to actual commercialization?

Answer. Here are some of the specific ways we're working to drive that work and how we're doing it with our partners at the Economic Development Administration, specifically with the Regional Technology and Innovation Hubs (Tech Hubs):

- Our team has *recently executed an agreement and partnership with the Economic Development Administration* focused on regional innovation collaboration to better coordinate our investments and leverage a whole-of-government approach to our respective investment programs. This allows coordination on investment decisions as well as shared data and insights. NSF participated in the technical review process for the Tech Hubs designations, providing technical and R&D insight as EDA sought to identify the strongest Tech Hubs designees.
- For the *NSF Regional Innovation Engines* program, we have built a post-award support platform informed by technical assistance conducted by the Economic Development Administration as well as private-sector models. The *NSF Engines Builder Platform* is a human-centered portfolio of support structures that empowers awardees with the tools, skills, networks, and capital needed to thrive. This is an entirely new way of thinking about post-award support in the Federal context. It's inspired and informed by the support systems pioneered by venture incubators and accelerators, national philanthropy, and lessons learned from prior place-based investment efforts. This will be a vital tool in connecting

innovation ecosystems and place-based investments to the supports they need to facilitate translation. These resources will support our forthcoming NSF Engines awardees as well as our previously announced Development Awardees. Key programmatic leadership from the Economic Development Administration's Tech Hubs program (as well as other programs) were included in our selection process for this platform to ensure cross-agency alignment.

- Through the Builder Platform, NSF will also work to identify alignment, create topical communities of practice, and shared investment opportunities where there is topical synergy between a Tech Hub and an NSF Engine or NSF Development Awardee. For example, identifying collaboration opportunities between the Tennessee-based *Advancing Technology-Enabled Mobility Solutions* NSF Development Awardee led by a variety of Tennessee-based educational and research institutions—including Vanderbilt, UT Knoxville, UT Chattanooga, Tennessee Tech University, as well as UT-Oak Ridge Innovation Institute, and others—and the multiple EDA Tech Hubs focused on the development of advanced lithium and EV batteries as well as autonomous vehicles in New York, Nevada, and Oklahoma. NSF has already identified and onboarded a lead organization to launch the Builder Platform and expects services and collaboration opportunities with Tech Hubs to roll out to awardees in January 2024.
- Finally, NSF is in the early phases of discussions with the Economic Development Administration and the Small Business Administration's Office of Investment and Innovation to explore co-creating pathways for NSF Regional Innovation Engines and Tech Hubs awardees to engage existing SBA translational programs with targeted programming and supports.

These are just a few of the ways EDA and NSF are working together and we're committed to expanding that coordination in the months and years ahead as we make generational investments in our Nation's ability to compete on the global stage and as we work to collectively bolster our national defense and advance our Nation's national security goals.

Question 4. The Tennessee Department of Labor and Workforce Development projects that Tennessee will experience significant growth in STEM occupations over the next decade. What programs does NSF have that could support Tennessee's efforts?

Answer. NSF helps contribute to growth in STEM occupations throughout the United States by funding projects across the agency that provide support for students and postdocs.

The Advanced Technological Education (ATE) program is the focal point for NSF's investments to bolster the preparation of the skilled technical workforce—the sector of jobs that require more than a high school diploma but less than a bachelor's degree. ATE provides grants to improve technician education at community colleges and in the Career and Technical Education (CTE) programs in high schools. The program seeks, in particular, to improve technician education in high-tech fields that drive the economy—biotech, cybersecurity, advanced manufacturing, microelectronics, semiconductor manufacturing, electric vehicle manufacturing, artificial intelligence, nanotechnology, etc. ATE reaches nearly 40,000 students and 9,000 teachers annually.

Notable projects include:

- "Preparing the Workforce for Industry 4.0s Intelligent Industrial Robotics," a collaboration among three institutions: University of Tennessee—Chattanooga, Motlow State Community College, and Chattanooga State Community College. This project is focusing on defining the necessary skillset for the next-generation industrial robotics technical workforce and creating a curriculum that will allow students to learn those skills. This project will result in one of the first programs in the Nation for workforce training in intelligent robotics and artificial intelligence technologies, and it will support U.S. businesses and industries to rapidly and effectively incorporate next-generation robotics in the workplace.
- "Integrating Electric Vehicle (EV) Technology in Legacy Automotive Programs" is a project at Northeast State Community College (NSCC). As EV technology continues to advance at a rapid pace and the number of electric vehicles on the road continues to increase, multiple training programs are needed including those that are integrated into legacy automotive programs to address the growing need for EV maintenance and repair technicians. This project is investigating the effectiveness of and documenting the unique challenges associated with integrating EV technology into a legacy automotive training program. Outcomes of this effort will include faculty professional development, a job skills

analysis, and curricular revisions, all of which will improve outcomes for students in the high need area served by NSCC.

- To better meet industry needs for a highly-skilled technical workforce, this project at Roane State Community College," Improving Mechatronics Education by Pairing Mechatronics Courses with General Education Math and Science Courses," is enhancing general education courses with mechatronics-related problems and examples, thus providing a context that is relevant to the students' career goals. Local area employers are integrally involved in course development and provide examples of complex mechatronics issues that can be incorporated into problem-based learning scenarios within the courses. A collateral benefit of this approach is that non-mechatronic students in these courses gain exposure to and an appreciation of topics and applications that are useful for their employment in STEM-adjacent fields.

RESPONSE TO WRITTEN QUESTIONS SUBMITTED BY HON. TODD YOUNG TO DR. SETHURAMAN PANCHANATHAN

The Section 10339B of the CHIPS and Science Act requires that a recipient institution of higher education, a foundation of the institution, and related entities must submit an annual "summary document" of financial support which is $50,000 or more from a foreign source associated with a foreign country of concern. We have heard stakeholder concerns that NSF's proposed rule would require institutions to report each individual gift or contract over $50,000 rather than a summary.

Question 1. Do you believe that your proposed rule is in agreement with the statutory text?

Answer. NSF believes that our proposed rule is in agreement with the statutory text. After comprehensive agency review, NSF released the proposed rule for public comment. In response to public comment, NSF reduced the data reporting requirement to fewer elements and has reviewed these data elements with several professional societies representing the university community. NSF feels it has achieved the appropriate balance between requiring the information necessary for data robustness and alleviating as much administrative burden as possible.

Question 2. If so, what are you doing to alleviate stakeholder concerns?

Answer. NSF has been meeting with professional societies to consider ways to help mitigate the administrative burden associated with this new reporting requirement, provide clarity on what "financial support" is scoped out of the reporting requirement, and solicit feedback on how the Foundation can develop the IT reporting system to minimize burden for the research community.

Question 3. Furthermore, the NSF's proposed rule, if implemented, would represent an increase in reporting requirements compared to similar requirements such as the mandate under Section 117 of the Higher Education Act—how will the additional reporting requirements ensure that Federal research funding is not siphoned into foreign countries of concern?

Answer. Through the creation of this reporting requirement, NSF will now have a mechanism to review "financial support" to recipient institutes of higher education (IHEs) in the forms of gifts and contracts that have conditions or "strings attached" that could seek to influence IHE's decision-making process as it relates to Federal research funding. By creating more transparency in this process, the Foundation will now have the authority to assess if/when potential foreign influence is being exerted on recipient IHEs that could result in Federal research funding being siphoned to foreign countries of concern.

Question 4. Do you believe the additional reporting requirements will create a significant administrative burden for recipient institutions?

Answer. NSF is structuring the reporting requirements to ensure robust data collection with as little administrative burden as possible. The Foundation believes it may be helpful to reevaluate this reporting requirement in two or three years to evaluate the benefit to research security and ensure we focus on reduced administrative burden to IHEs.

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