



1111 19TH STREET, NW
SUITE 406
WASHINGTON, DC 20036
TEL: 202-461-2360

ADVANCING CRITICAL SUPPLY CHAINS FOR
AMERICA'S TRANSPORTATION AND ENERGY NEEDS.
COMMANDINGHEIGHTS.ORG

CHIPS Act and Onward: Next Steps to Reshore Semiconductor Manufacturing

FEBRUARY 18, 2022

TRANSCRIPT

Participants:

Senator Mark Warner, D- VA (video message)

Sreenivas Ramaswamy, Senior Policy Advisor, United States Department of Commerce

Michael Splinter, Co-Chair American Semiconductor Center, Former Chairman and CEO Applied Materials

Admiral Jonathan W. Greenert, USN (Ret.), Co-Chair American Semiconductor Center, 30th Chief of Naval Operations

Moderator:

Dr. Jeb Nadaner, Executive Vice President of Government & Public Affairs at SAFE, Executive Director of SAFE's Commanding Heights Initiative

See SAFE Event Page for Video: <https://secureenergy.org/chips-act-and-onward-next-steps-to-reshore-semiconductor-manufacturing/>

Jeb Nadaner:

Good morning, everyone. My name is Jeb Nadaner. I'm the Executive Vice President of Government and Public Affairs at SAFE, and the Executive Director of our Commanding Heights Initiative. For those of you who are new to Commanding Heights, we are a bipartisan initiative. We are dedicated to advancing reliable sourcing, and reducing unsustainable dependencies, for the products and materials necessary for America's energy, transportation and national security needs.

Commanding Heights is part of the SAFE Alliance, a group of projects covering energy security, supply chains, autonomy, reimagined mobility, electrification, decarbonization, and grid security. We are supported by our Energy Security Leadership Council (ESLC), which consists of Fortune 500 business leaders and former four-star military officers, all of whom are committed to strengthening the U.S. economy and national security.

This brings us to today's event hosted by our newest project at SAFE, the American Semiconductor Center. SAFE's roots are in America's transportation and energy needs. Today, the semiconductor supply chain is critical to these sectors. And it is a cornerstone of America's modern economy and overall national security. The American Semiconductor Center is laser-focused on two critical goals. First, designing and building more semiconductors here in the United States. And second, protecting our semiconductor supply chains "out there," in our friends and allies in Asia and in Europe.

The Center is co-chaired by Michael Splinter, the former CEO and Chairman of Applied Materials, and current board member of TSMC, and Admiral Jonathan Greenert, our nation's 30th Chief of Naval Operations. We are a mission-driven organization designed to create change. We are not a traditional think tank. We are not a trade association, though we aim to complement the outstanding semiconductor trade associations, such as SIA and SEMI. We do so with the support and leadership of the patriotic business and national security leaders of our ESLC.

Today, we will hear from a distinguished group of participants, each a leading voice on our subject. Virginia Senator Mark Warner, the Chairman of the Senate Select Committee on Intelligence, will be joining us via a recorded message to share his vision of the CHIPS Act way ahead. Then the Secretary of Commerce's Senior Advisor, Sree Ramaswamy, and Mike Splinter will join us for a panel discussion. Finally, we will talk with Admiral Greenert about the national security threats to our Asian semiconductor supply chains. Now let us begin with Senator Warner.

Senator Warner:

I'm Virginia Senator Mark Warner, and I want to thank SAFE Commanding Heights and the American Semiconductor Center for this opportunity to talk about the challenges and

opportunities that exist within the semiconductor industry. The challenge we all know is: we've got a shortage of semiconductors. That is playing out in real time, particularly in the auto industry right now, where cars that are made in America can't be purchased by Americans because there's a shortage, a worldwide shortage, of the legacy semiconductor chips that will go into those cars. We also know that, unfortunately, in America, we're not making as many semiconductors as we used to. This is a market where over 30 percent of all the semiconductors in the world were made in America. Now that number's down to about 12 percent. While we maintain some of our lead in machining and packaging, we need to do more.

It's one of the reasons why the so-called America COMPETES Act—which has had a variety of different names—why getting that bill to the President and getting it signed, is so critically important. This is the first time where the United States is literally going to put its money where its mouth is in terms of investing in semiconductor manufacturing facilities, or fabs, right here in America, and continuing the research and development to maintain America's cutting-edge lead. That legislation will provide \$52 billion, \$40 billion of which is to build fabs here in America, \$12 billion of which will be for R&D, machining and packaging, and other components. The good news is that a variation of this bill has passed both the House and the Senate. It's now incumbent upon us, and I hope to be on the conference committee, to make sure we resolve the differences between those two bills and get that bill to the President for signature.

We need to make these investments because, in the meantime, we've seen China investing literally \$100 billion in trying to bring semiconductor manufacturing to China. We continue to see Taiwan take a not only regional, but global lead in semiconductor manufacturing. South Korea, Japan, Singapore, the Netherlands—this is a very competitive space. In many areas, we have to work with our other democratic partners around the world, but we also need to make sure we maintain that American lead as well. So, let's make sure we get that legislation to the President's desk and get those dollars back into the economy to create American jobs, to help American security, and to make sure that we maintain our technology lead in this critical area.

Jeb Nadaner:

Many thanks to Senator Warner. As he makes clear, we have a big agenda before us and before our country. I would now like to welcome the Secretary of Commerce's Senior Advisor, Sree Ramaswamy. I'd also like to welcome Mike Splinter, our Co-chair of the Semiconductor Center. And now Sree, I'd like to give you the floor.

Sree Ramaswamy:

Thank you, Jeb. Thank you for inviting me, and I will also pass on the gratitude of Deputy Secretary Don Graves. He does send his apologies for not being able to make it and thanks you for the invitation. As Senator Warner said, I think now that the House and Senate have each passed their versions of the competition bill, here at Commerce, both Secretary Raimondo and

Deputy Secretary Graves are urging Congress to move as fast as possible to work out those differences between the bills. There is a lot of area of common agreement. And so hopefully, we can get a final version to President Biden's desk for his signature. Commerce is pushing strongly for this legislation as are many other folks because we do believe it will unleash the next generation of innovation in the United States and also shore up supply chain resiliency.

The Senator talked about the \$52 billion that would be invested. We have also seen several encouraging developments from the semiconductor industry. Intel recently announced that it plans to build what could be the world's largest semiconductor facility in Ohio. But the reality is that the semiconductor supply chain remains fragile. The Commerce Department published the results of a chip shortage RFI just a few weeks ago. And it showed that there is so little inventory, and the supply chain is so fragile that at this point, if there is a COVID outbreak, or a natural disaster, or some kind of political instability that disrupts some foreign manufacturing facility, that could easily shut down a U.S. manufacturing facility here. It puts American workers and their families at risk; it puts American consumers at risk.

Chips are also essential components of our vital and sensitive military equipment. Our over-reliance on foreign manufacturers is a serious national security vulnerability. So, we have both an economic security imperative and a national security imperative to solve this crisis. And I think that one of the messages that we have been trying to convey is the urgency of action because, as the Senator said, our competitors, even our trading partners, are moving ahead with some pretty aggressive plans to shore up their own semiconductor industries. And so, it really is time for us to move forward. Every day that we wait is a day that we fall further behind. And the investments that we need to make are too important to get tied up in process.

What we know is that several members of Congress, both Republican and Democrat, have been crucial in getting both the House bill and the Senate bill to where they are today. We appreciate that a great deal. And the Secretary and the Deputy Secretary are continuing to engage with members of both Houses daily to make sure this gets done, because I think getting the bill signed into law will create good jobs. It will rebuild American manufacturing; it will allow us to start thinking about revitalizing this industry in a way that strengthens the supply chains. Not just in the immediate term, but for decades to come.

Jeb Nadaner:

Thank you, Sree, for those thoughtful remarks. I want to stress to you that SAFE and its leadership want to be of help and to support the Secretary, the Deputy, the Commerce Department, and the President in any way we can to see this legislation passed. So, we stand ready. Thank you for being with us today and for those remarks.

Sree Ramaswamy:

Thank you.

Jeb Nadaner:

Mike Splinter, you now have the mic.

Mike Splinter:

Thanks Jeb, and thanks, Sree, for those comments. You know, this is an extremely complex topic because the technology is complex, the logic of the way the industry has evolved is complex, the questions we have to answer are complex, and therefore we have to have complex answers. But in the end, the discussion really gets down to security of our supply chains. And as Sree said, the security of our country.

In addressing the current shortages, there are completely different issues depending on whether you are talking about the leading edge of technology or older generations of technology. To give you a sense of that, and of that complexity, you just have to think about a smartphone, an iPhone for many of you. That phone might have a couple of advanced processors that are made on newer generations of technology. It also has five or six radios. It has a display driver, five cameras, a graphics controller, a wireless power converter, and many, many power-management chips.

Each of these chips comes from a different factory that produces different types of technology. And some of these factories might be 10 to 30 years old. That might surprise many.

Understanding this complexity is important because solving the problem will have different approaches when we think about producing more integrated circuits in the United States. We have to decide what we want to do in some level of priority order. If we want to produce all the micro controller chips for automotive companies in the U.S., that's a very different proposition than, once again, becoming the most competitive at the leading edge of technology.

I would also like to touch on some of the reasons why the industry evolved overseas the way it has. Some of you know this story well, but it might be instructive for others. People often ask how did countries like Taiwan and South Korea, and specifically Taiwan Semiconductor Manufacturing Company, or TSMC, have the ability to outpace U.S. semiconductor manufacturing? The assumption is that they got lots of help from their government and that's how they did it. Well, early on, they might have gotten help from the government, significant help. But it wasn't the most significant factor in how the industry evolved. In the case of TSMC, they came up with a better business model. They focused solely on the manufacture of integrated circuits for other people, the so-called pure-play foundry model.

The pure-play foundry model enabled a whole new kind of company. Many of these companies are in the United States; they're called fabless semiconductor companies. And in fact, they're a

critical component in leading design of new semiconductor products in the United States. As these semiconductor companies grew, so did the semiconductor foundries. Then as the cost of building a semiconductor factory for each new generation of technology increased, and the economies of scale were achieved at larger and larger volumes, smaller integrated device manufacturers realized they could not make the chips as cheaply as a foundry like Global Foundries or UMC or TSMC. So, they stopped manufacturing their own chips and asked the foundry companies to do that fabrication for them. This accelerated the growth of the foundry companies and allowed them to invest heavily in R&D over a long period of time.

So let me divide up the problem we seem to be facing in into three segments. First, the leading edge being built in the United States: there needs to be a long-term plan to level the playing field in costs in the United States for foreign and domestic manufacturers at the leading edge. Specifically, these companies are Samsung, Intel, and TSMC. There needs to be more funding and encouragement for research and development of semiconductors in the United States. We need more PhDs in the physical sciences. We need the three leading edge companies to do more of their R&D here in the United States. And we should set up incentives for this to occur. All these things largely are supported by the CHIPS Act, which I can only strongly encourage Congress to get reconciled and funded as soon as possible.

Second, technologies that are in the 5–10-year range—in industry parlance, this would be 10 to 28 nanometers—that maybe sounds advanced, but for this industry, it's not. Customers should work with their suppliers to add capacity to their factories and even build some new factories. That is if they can be done cost-effectively. These factories might be in the U.S., or they might be elsewhere also.

Third, technologies older than 10 years. Some of the technologies that we're talking about here might be as old as 30 years. The customers should work with their suppliers to see if they can increment capacity and aggressively move products to new generations of technology to relieve this over-demand situation we're seeing today. This is critically important and not often talked about, but for these older generations of technologies, it's very difficult to build a new factory. And if you could build it, could you do it cost-effectively or even find the tools to populate that factory? These things are very difficult in these older generations, so we have to find multiple solutions for the oldest generation of technology. So, Jeb, I'll turn it back to you for the discussion.

Jeb Nadaner:

Thank you both so much for setting the stage.

Sree, I'll start with you. What are some of the actions the Commerce Department is taking with regard to the issues that Senator Warner and Mike have raised?

Sree Ramaswamy:

At this point the legislation hasn't passed. We have a general idea of the contours of the bills. Obviously, there's a lot of similarity between the Senate and House versions of the CHIPS provisions, but we do know there are some things that are still being worked out. So, part of it is us being part of that discussion to be able to inform some of the decision-making on the Hill.

There's certainly a lot of engagement going on with the industry. And I would certainly encourage a lot more engagement, particularly with the broader ecosystem. We are seeing that obviously, the semiconductor industry has been really vocal and very helpful through this process. We'd like to hear more also from the customers of these chips, from the investors in these chips, from the universities and the entrepreneurs who are making new types of chips. We'd like to be able to hear more from them.

There is a request for information (RFI) that Commerce published just a couple of weeks ago, asking for broad input from a wide range of stakeholders on various aspects of the CHIPS program—on the manufacturing incentives, on the NSTC, the R&D program, on the packaging program.

And then also these other questions about how should we be thinking about workforce considerations. We know there's going to be a workforce challenge.

How should we be thinking about crowding in private capital? Fifty-two billion is a lot of money, but if you look at the total amount of capital investment in this industry over the next decade, it's pretty clear that you need even more funding from private capital. So, they have to be able to step up in a big way.

And then I think more broadly, one of the things that we are thinking through here is just very fundamentally what portions of this program are really an opportunity to change kind of the fundamental economics of the industry. But as Mike said, we've gotten ourselves into this situation where you've got this extreme national security vulnerability. That happened because of economic factors that have driven these factories overseas, certain things that have happened in the industry that Mike called out as well.

So, is there a way for us? We know that the industry is approaching a number of different transformations—on the technology side, with the slowing of Moore's Law and on the economic side with the fact that these constant price declines have sort of stopped and have even reversed recently. With the industry structure having changed from being very open and collaborative, parts of it have become, the roadmaps have become, more closed. So, there's a bunch of these

things that we are looking at, trying to understand, what is the opportunity to change some of that and put this industry back on a more vibrant footing. We certainly want to solve challenges for the manufacturing capacity and the technology leadership, but can we use this opportunity also to solve for some of these longer-term issues so that we don't have to deal with these sorts of problems in the future?

Jeb Nadaner:

Thank you, Sree. This is the most comprehensive effort undertaken by government in years in formulating a long-term semiconductor strategy. If, or when, to be optimistic, the CHIPS Act passes, what are some of the Department's plans to get off to a quick start in execution?

Sree Ramaswamy:

That's a million-dollar question, isn't it? I think to be honest, because it has taken a few months to get us to this point, there is this expectation that when things actually pass, we're going to turn on a dime and start shipping money out the door right away. I think all of us acknowledge that's really not realistic. To start with, Commerce can't hire anybody until funding comes through. And so, I think the first step is going to be once the funding comes through, we have to start staffing up the program office for CHIPS. We have to start getting in experts. As Mike was saying, I mean, this is a really complex supply chain. And so, it isn't really a single supply chain—the broad economics, the 30, 40% subsidies, yes, that's all true. But the way it plays out in legacy logic is different from advanced logic; it's different from memory chips.

And so, we need a wide range of subject matter experts to be able to come on board to help advise the way we set out these funding proposals, the way we think about oversight. So that's going to be our immediate priority is to make sure that we get those people and staff up this office in a way that reflects kind of the importance, as you're saying, how important this program actually is. I think once we have that, what we'd like to be able to do is also continue to engage, using this request for information and the responses we're getting. We'd like to have a broader engagement with the industry and the broader ecosystem as well, to try to sharpen some of these issues, to try to understand some of the economic differences. And that will certainly help us with the funding proposals.

I don't know if I can go into a whole lot more detail about how we're trying to run the program. Things are still moving on the Hill, so we can't really move ahead of them, but we've certainly got a certain sequence in mind of how we would like to see different programs being rolled out. Certainly, there's a chip shortage. I mean, we want to make sure we're responsive to that, knowing full well that it takes a year or two to get new capacity coming online, but we certainly want to see if we can be responsive to that as well.

Jeb Nadaner:

Thank you, Sree.

One last question, before we turn to Mike: Does the administration support participation of friendly and allied companies from abroad in CHIPS Act funding?

Sree Ramaswamy:

So, I think the Secretary has been pretty clear that we welcome foreign investment. I think if you look at the supply chain, it's pretty obvious that there are portions of the supply chain where if you are really serious about shoring up capability for the U.S., you're going to need foreign companies to participate, whether that's in the tools, in some of the upstream chemicals and materials, in the actual fabs and the processes themselves. I mean, there are many of these places in the supply chain where when you look at who's leading in that supply chain, it's a foreign company. And so, I think both on the manufacturing side of this program and on the R&D side, we have to find a way to make sure that foreign companies are participating.

Jeb Nadaner:

Thank you. We at the American Semiconductor Center believe that one of America's strengths is its allies and friends abroad, both in economics and national security.

Sree Ramaswamy:

I should perhaps add to that if you don't mind. We have not talked about the engagement that we have at the government level with the allied governments, but certainly that's going on as well. As I said in my remarks, many of our partners and allies have come up with their own announcements to support their semiconductor industries. And so, there's a lot of discussion going on at the government level of how we do this so that there's actually some level of coordination, that there isn't a race to the bottom, that we don't end up inadvertently oversupplying the industry and then destroying the economics of the industry. So those sorts of conversations are going on as well.

Jeb Nadaner:

We much appreciate that, Sree.

Mike, what do you see as some of the most important design and innovation challenges facing the US segment of the industry?

Mike Splinter:

I'd first like to emphasize that in the design, at product design in particular, the U.S. is leading the world. So, it's quite different from the manufacturing sector where we've dropped from leading the world, having over 30% of the semiconductors manufactured here in the US, to now 12%. In the design area, we're still leading. We're making the most advanced chips; we're designing the most advanced chips for things like AI, machine learning. In fact, I like to say this is the most exciting time in the semiconductor industry that we've probably seen in the last 25 years, because there's so much innovation going on. Part of our responsibility and part of the thing we have to pay attention to is: can we keep that lead?

And the way we can keep that lead is by producing more great engineers—engineers with the ability to design these next-generation chips—and companies that have the innovation and the brilliant ideas of the next generations of technology and the next phases of new products. We used to call it the next big thing, but now there's lots of next big things going on, and getting the CHIPS Act passed is going to take a period of time to have an impact on the manufacturing side because of the dynamics of that side of the business. We're going to have a fast impact on accelerating our lead in the product design area, because you can be sure that China is also investing very heavily in this phase of the industry. There are hundreds and hundreds of fabulous semiconductor companies in China, just like there are here. And those are the companies that are doing the product innovation, Jeb.

Jeb Nadaner:

Yes. There are areas where the U.S. is behind in manufacturing. There are also the areas where we are ahead. It is important to catch up where we're behind, but where we're ahead, this is a major U.S. competitive advantage in the world, and we have to maintain that competitive advantage.

Mike Splinter:

Yes, it really is. And we've been focusing an awful lot on the deficits, but we should focus on our strengths as well because we still have many, many strengths. And frankly, the voice Sree was talking about, the voice of the industry, the voice of those customers in the U.S.—largely by the Semiconductor Industry Association—I think has been very strong in this discussion.

Jeb Nadaner:

Yes, there has been some pioneer work from SIA over the last two years that I found personally very helpful when I was in the Defense Department. Mike, one last question before we turn the next segment: What are some of the opportunities for collaboration, particularly between the U.S. and companies like TSMC and Samsung, our friends and allies?

Mike Splinter:

Well, if you look at the landscape of the industry, there are really three leading edge companies. I mentioned them earlier, Intel, Samsung, and TSMC. I think if we really want to recapture the lead here in semiconductor manufacturing, we need to be working hand in hand with all three of those companies. Now for Intel, they manufacture here and have a system of developing new technologies and manufacturing them here. For Samsung and TSMC, that's not the case. Their R&D is done in Korea and Taiwan, respectively, and moving these technologies to a factory on a different continent is an incredibly delicate process. In one of these semiconductor technologies, there are literally thousands of incredibly intricate steps in the manufacturing process, any one of which could delay or destroy the startup of a new factory.

So, I think it's important that we understand that problem. The most obvious problem is the difference in cost. And I believe we have to work on the product in the U.S. because fundamentally, costs are higher here. Labor costs are higher and regulations are stricter here—that results in higher product costs. To some degree, customers will be willing to pay some of the higher product costs, but not double the cost. So, there's lots of work to do. This has to be long-term thinking and by long-term, I'm thinking 20 to 25 years for us to continue to focus on this industry. The importance of the industry is not going away. But we also must work on the productivity end and automation and research, so that these cost differences can go down over time and we don't rely on government incentives over the long-term. The way to do that is to level the playing field through other methods than just being more productive, being more innovative in the United States. I think that's a critical part of this cooperation.

Jeb Nadaner:

Thank you.

Sree, any comments before we turn to the next segment with Admiral Greenert?

Sree Ramaswamy:

No, I think I completely agree with Mike. I mean, I think it is a long journey. I don't think we should be looking at this as a short window of doing things. This industry is not going to go away in importance. And I think that's a good thing. But I think it behooves us to then use this CHIPS Act, the chips funding, and look at it as a long-term opportunity and ask ourselves, all of us: how do we maximize the long-term potential from this window that we have?

Jeb Nadaner:

Thank you, Sree. Thank you, gentlemen, for setting the stage.

I'd like now to turn to the next segment with Admiral Jonathan Greenert, the Co-Chair with Mike Splinter of the American Semiconductor Center, to discuss the security threats to our Asian semiconductor supply chain. Hello, Admiral.

Admiral Greenert:

Hello, Jeb.

Jeb Nadaner:

What do you see as the threats to the US semiconductor supply chain?

Admiral Greenert:

Well, they are many and diverse, but I think what I'll start off with, listening to your introduction—you use the term “unsustainable dependency,” part of the charter of SAFE. And we're here at an unsustainable dependency. As a military person—and I spent a career in a military—we spent a lot of time in the Middle East, and it was all about an unsustainable dependency on oil and energy coming from the Middle East. We remain the caretakers of the Strait of Hormuz. We all, as Americans, experienced just a few years ago what turned out to be an unsustainable dependency on somebody else providing us vaccines and medical support equipment as we dealt with the pandemic. Fortunately for us, we were able to access a lot of things we just didn't have through a partner, India, and some others. We may not have that option here. And there are perhaps scenarios where this is worse than the previous two crises.

Now let me get to your question. I think the threats—there's a spectrum of threats in this regard. China is the key for the most part, but there are others. First, I guess I'll call it the most likely. And I think the most likely is a cyber-attack on the chip industry in Taiwan and in South Korea. That attack per se may not be going on, but there's probing going on every single day. They are in and around the industries and networks to figure them out—they being China. It would be crazy for China to shut it down now because they're dependent as well. But so, there may be time, but who knows how long. There's economic pressure, as a threat on customers and suppliers. We've seen China act in that regard, in other areas, both on Taiwan and on South Korea.

If China is successful in joining the Comprehensive and Progressive Agreement for Trans Pacific Partnership, the son of the TPP, I'm not sure where that'll take them in regard to influence trade in general. Who's to say? And regarding the theft of intellectual property, as Mike pointed out and as the Senator pointed out, China needs and wants to design and build chips in there. So where are they going to get it? Well as a military person, that's where China got their ballistic missile technology, their stealth technology. They stole it from us predominantly, but also from the West generally.

Those are the most likely scenarios. Cyber, economic pressure, theft. What I call unlikely, but certainly catastrophic, would be a military scenario. I call it unlikely because China's smart enough to realize it's an unpredictable outcome. There are a lack of off-ramps and every time anybody has entered into a military expedition, if you will, or campaign, the outcome is just unpredictable.

The scenarios, I think in a military case, would be a cyber-attack, as I mentioned, on critical infrastructure. Then maybe, and I put these in order of less likely, so less likely would be a blockade of Taiwan's key ports or air fields and nodes, ballistic missile attack, cruise missile attack, airstrikes. Now we're getting into kind of killing the goose that's laying the golden eggs—if you don't have your own infrastructure, if you're China in that case.

And then lastly, invasion and occupation, and that's a “bridge way too far” at this point.

But currently, the whole issue is that China has a hybrid or gray zone campaign going on. In the South China Sea, the East China Sea, in and around what's called the contiguous areas. And think of that as just outside territorial waters, just outside of territorial airspace, where they operate and they have a campaign in progress.

We see it every now and again, it pops up in the press. China's justification, in simplistic terms, is that they take domestic policies on the way they think things should be, and they apply them in the international domains or space. So, for example, the nine-dash line—why do you think they call it The South China Sea, The East China Sea? And, of course, recently the air defense identifications zone where they insist that aircraft, commercial and otherwise, identify themselves when they fly in and around an area of China. If I were to talk in simplistic terms—we talked about the threat—but it's the threat to what?

Turning to the chips themselves, as a military person, I would say there are three categories of semiconductor needs that are key and critical today.

One is we need the most capable chips. Mike mentioned it. It's good that those are developed in the United States, but are there enough for modernization of our strategic nuclear systems, modernization of our cyber capabilities, our satellites, AI, and machine learning? We need the most capable.

Number two, the chips that we have for strategic nuclear command and control, for cyber, they have to be secure and reliable. They can't be corrupted. We have to understand the pedigree from whence they came. And then lastly, even the latent chips, we have to have enough of them. Everything is microelectronic today, steering systems, air conditioning, things that we just really don't think about. It's all microelectronic. It's all latent chips. We have to have enough of them to not only modernize, but to sustain our defense systems. Thank you.

Jeb Nadaner:

Thank you. We have an article coming out soon on stockpiling some of the legacy chips till we can jump to the current generation.

Admiral, you mention a number of scenarios. Successful deterrence is always better than war. What do we need to do to increase deterrence in the Asia Pacific area?

Admiral Greenert:

Well, there are two predominant entities we need to deter: North Korea is one, but the bigger one is China. We have been successful since the end of World War II deterring China from conducting any operations, attacking or overly influencing Taiwan and others through conventional deterrence. That is, we have the preponderance of advanced capability and the ability to use conventional forces. I think the best example of that was the Taiwan Straits Crisis of the mid '90s. Most of us are old enough to remember that. China was conducting ballistic missile tests firing into the seas around Taiwan. And we were able to show up with two carrier battle groups at that time. China had no answer for that. So, they backed down. It was a lesson learned; they said, "Never again." And that has led to a lot of what we see today.

But to your question, we for the longest time deterred China with our conventional capabilities and supremacy. It's different now. We really have three means of deterrence. And we need to understand and act on all of them. First, believe it or not, is nuclear. China has recently established a modern triad, still in progress, but they currently have nuclear bombers, nuclear-capable bombers with nuclear bombs, nuclear-capable ICBMs with the nuclear warheads, and submarine ballistic missiles on patrol. That's relatively new. China also has abandoned its previous no first-strike policy.

China had less control when to pursue an "off ramp" in a security crisis involving a nuclear capable nation; if the military situation escalated, there were few, if any, nuclear options in their arsenal to underwrite their actions. They would have to back down or take an off ramp. Not the case in the future if they successfully modernize their strategic nuclear TRIAD. Accordingly, we need to continue to modernize our strategic nuclear TRIAD.

Two is our conventional forces, which I spoke to in my earlier remarks. We have to have a credible capability, and we have to show the will and the means to employ it. Allies are key and critical, not only for helping us in that regard, providing access, but operating with us. We have to have assured access in the First Island chain. We have to have that assured access, protect Guam, and continue to nurture the Quad, and other allied support from Japan, Australia, and Korea. And to demonstrate the ability to impose costs in case of conflict.

Lastly, we have to figure out how to deter this gray zone hybrid operation. It's not sustainable, using that term again. The current situation where they are iteratively moving closer to Taiwan, harassing Taiwan, they do the same in the Senkakus, and they just move further out. And regarding the islands that they created, if you will, in the South China Sea—the bases we're familiar with—we have to re-review our mutual treaty with Japan, which is only in place for armed conflict. China's hybrid operations are short of armed conflict. Again, not sustainable. So, we need to review it, reestablish our tenets, reestablish our limits, red lines, if you will, and figure out how we're going to act. Key and critical to all of this will be helping Taiwan with defensive weapons systems, strategy, and the means to communicate and exercise with them. And that must be done in a deliberate manner because we know the sensitivity with China and Taiwan. Thank you.

Jeb Nadaner:

Thank you, Admiral Greenert.

Our allies and friends throughout Asia, from India on one end, to Australia, Indonesia, Taiwan, Japan, South Korea, Singapore, Vietnam—are all critical American strengths. Thank you so much for those comments.

I'd like to open up the floor now to audience Q&A. I've received a number of questions.

The first question is for Sree, from Patrick Wilson. When the industry is experiencing an incredible labor shortage, how will the Commerce Department compete, help the country and the industry compete, for the talented staff to make new programs work?

Sree Ramaswamy:

Yes, that's a good question. We are looking at the workforce considerations. At this point we've got three different pipelines of workforce that we need to think about. At least three. One is the process engineers and the material scientists and the chemists that you're going to need once we built these fabs and to drive the research agenda. Two is the technicians—the tooling technicians and the maintenance and the installation of the equipment—once these fabs are built, to make sure that we've got a strong workforce there. And then three, I think even more urgent than that, is the construction workforce that we need to build some of these clean rooms, to do high purity welding. And so, there's a lot of that activity that needs to happen.

And yes, I think it is a question of how we ramp up that workforce quickly. That is in fact one of the questions that we have asked in the RFI. Certainly, the individual states and counties and cities where some of these big announcements have happened are already starting to work with the companies through their community colleges and through their universities. But it is an open question about what else can we do, or should we be doing, to make sure that we are addressing

these things in a way that quickly ramps up to scale? So, we're certainly hoping that we get some creative input on that question.

Jeb Nadaner:

Thank you. This is a closely related question from Vikram Singh, who's been a long-time hand in several recent administrations. With regard to the human capital that is needed: is it a question of universities first training the people, or is it a question that more facilities, more fabs, more design centers, need to go up in the U.S., and that'll create the demand signal that will lead universities and their students to want to enter this field? Mike Splinter, you want to take a first shot at that one?

Mike Splinter:

Well, I think you have to create the demand and the excitement again around the industry. I think if the visibility that has been brought to the semiconductor industry during these last two years of shortages—well, that's been a problem for a lot of industries and certainly for our security—has brought attention again to this issue, and now more engineers are thinking about semiconductors as a discipline and as a depth of study. So, I think that you have to move forward with building factories, doing more R&D to create the excitement so that engineers want to be in this field. There's lots of engineers in this field, but more engineers want to be in this field.

Sree Ramaswamy:

Yes, I would agree. You can't just have a workforce pipeline. There are programs we've done as a government in years past where we've tried to boost manufacturing purely on the supply side—we know it doesn't work. You need the demand signal. I think the question for us is how much of a demand signal do you need? Is it already there? As Mike said, there's already excitement building, but is that enough? Because I think by the time you built the fabs, you want to make sure that the pipeline is there. It is a four-year pipeline, so we have to start now. And so, we would hope that the demand is already being communicated, and certainly there more things that should be done to strengthen the demand signal. I mean, that's definitely something we want to do.

Mike Splinter:

As Sree points out, Jeb, there's a broad array of skills that need to be accessed by these companies, and precision welding is very, very critical for building one of these factories. You just can't imagine how many people it takes to build one of these factories, but there are many of those kinds of trades that are also important. So, it's not just PhDs or advanced degree engineers. It's a broad array of skills and capabilities that we need, and they need to be very productive.

Jeb Nadaner:

That's one of the things I discovered in the last few years visiting foundries: just how many jobs go into the production of the actual fab and then the running of the fab. There's a lot of jobs, ancillary jobs, vitally important to the running of the fab, such as water treatment, that occur outside of the fab that are key. So, these are huge gains to communities and states that have them also.

Related question from Patrick Wilson, from a very important company, MediaTek, is how is Commerce thinking about allocating funding in the CHIPS Act, should it get passed, between semiconductor manufacturing equipment versus materials for semiconductor manufacturing equipment?

Sree Ramaswamy:

I don't know that I have an answer to that. We have a general idea how we want to spend the funds, but it's going to depend on the applications that come in. Certainly, what we want to see are applications that can prove the economic viability in the long run, without additional financial assistance from the government. That's one of the requirements. We want to be able to build out a broader ecosystem. So, it is the fabs, but it's also the ecosystem around it. But I don't know that I'm in a position to answer specifically how much we would allocate to tools and equipment versus materials, except to say that, yes, it's all important. We want to make sure that ecosystems are here.

Jeb Nadaner:

And the Congress will have a lot to say about that. The Executive Branch can't spend a penny unless the Congress appropriates it.

Sree Ramaswamy:

One more reminder of the fact that nothing is in law yet, actually passed on the Hill and signed by the President. So we still have to wait for the actual thing to become law.

Jeb Nadaner:

I want to thank each of our guests. This has been a wonderful conversation. Sree Ramaswamy from Commerce—thank you so much for joining us. Mike Splinter and Admiral Greenert, our Co-chairs—we extend our deep appreciation. And to Senator Warner, the Chairman of the Senate Intelligence Committee, always a welcome guest at SAFE.

It's clear from today's session that Congressional action on CHIPS funding is one of the most important measures it could take this year, and do so on a bipartisan basis. A win for the United States of America. The fabless pure-play ecosystem is an American and allied competitive strength. And finally, America, with its friends abroad, can build more semiconductors here and

can successfully protect those supply chains out there. So thank you to all of our attendees for joining today's program.

Please stay tuned for our next American Semiconductor Center event.