

**PROMOTING AND INVESTING IN SMALL  
AMERICAN MANUFACTURERS**

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**HEARING**

BEFORE THE

SUBCOMMITTEE ON OCEANS, FISHERIES, CLIMATE  
CHANGE, AND MANUFACTURING

OF THE

COMMITTEE ON COMMERCE,  
SCIENCE, AND TRANSPORTATION  
UNITED STATES SENATE

ONE HUNDRED SEVENTEENTH CONGRESS

SECOND SESSION

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SENATE COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION

ONE HUNDRED SEVENTEENTH CONGRESS

SECOND SESSION

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# PROMOTING AND INVESTING IN SMALL AMERICAN MANUFACTURERS

TUESDAY, DECEMBER 13, 2022

U.S. SENATE,  
SUBCOMMITTEE ON OCEANS, FISHERIES, CLIMATE  
CHANGE, AND MANUFACTURING,  
COMMITTEE ON COMMERCE, SCIENCE, AND TRANSPORTATION,  
*Washington, DC.*

The Subcommittee met, pursuant to notice, at 2 p.m., in room SR-253, Russell Senate Office Building, Hon. Tammy Baldwin, Chairman of the Subcommittee, presiding.

Present: Senators Baldwin [presiding], Blumenthal, Peters, Sullivan, Fischer, Blackburn, and Young.

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

Senator BALDWIN. The Subcommittee on Oceans, Fisheries, Climate Change and Manufacturing will come to order. Good afternoon. Today's hearing is on "Promoting and Investing in Small American Manufacturers." And I could not be more excited to discuss this topic with our expert panel of witnesses and my colleagues on the Subcommittee who will be coming in and out throughout the afternoon.

I want to extend a warm welcome to all of our witnesses and thank you all for traveling to Washington to discuss this very important topic. I also want to thank the Chair of the Full Committee, Maria Cantwell, and Ranking Member of the Full Committee, Roger Wicker, and my Ranking Member on this Subcommittee, Dan Sullivan, and their staffs for their ideas, support, and encouragement during the development of this hearing.

This hearing will highlight investments authorized in the CHIPS and Science Act, intended to help manufacturers better compete in the global marketplace. As appropriators work on a deal for the Fiscal Year 2023, I hope that they will keep the value of these investments in mind.

As an appropriator myself, I know I will. Wisconsin is one of the top manufacturing states in the Nation in terms of the percentage of employment in manufacturing. And I have the great fortune to work with many manufacturers in Wisconsin of all sizes during my time in Congress.

This hearing's focus on small manufacturers is of particular interest to me, not just because of how many there are in my state, but also because of the crucial role small manufacturers play in making our supply chains more robust.

Department of Commerce programs like the Manufacturing Extension Partnership provide incredible value to small and medium sized manufacturers by helping them become more productive, defend against cyber-attacks, or upskill their workforces, which in turn makes our economy more resilient.

I am also very interested in hearing from our witnesses about how we can encourage domestic production of technologies developed at Federal agencies and in particular our Manufacturing USA institutes.

I recently introduced legislation with Senator Portman called the “Invent Here, Make Here Act” that tightens the waiver process for foreign manufacturers to license federally funded inventions at the Department of Homeland Security.

The legislation was inspired by media reports of breakthrough battery technology invented in a Federal lab being licensed to a Chinese manufacturer. I hope to introduce broader legislation for the Commerce Committee’s consideration next Congress and look forward to working with my colleagues on that issue.

Finally, I hope to discuss how funding regional innovation hubs can create virtuous cycles of reshoring, that can shorten our Nation’s supply chains. As we learned during the pandemic, it only takes a few key inputs to go missing for whole production lines to grind to a halt.

With that—are you ready? I will turn to Ranking Member Dan Sullivan for his opening statement.

**STATEMENT OF HON. DAN SULLIVAN,  
U.S. SENATOR FROM ALASKA**

Senator SULLIVAN. Thank you, Madam Chair. And I am pleased to welcome our distinguished witnesses today as our subcommittee focuses on the Department of Commerce’s manufacturing programs that will increase our Nation’s competitiveness. And I think this is an area that we are seeing increasingly bipartisan agreement on and bipartisan focus on, certainly here in the U.S. Senate.

And part of the reason is, is because of the supply shocks that our country has faced over the last several years, but particularly during the pandemic, and how much manufacturing resides outside of the United States that could be brought back, that has been impacted by these supply shocks.

And I think it has been an awakening for our country. It has been an awakening, certainly when I saw and remember during the pandemic, senior Chinese Communist Party officials talking about the stranglehold they had over key pharmaceuticals. And I still have this quote memorized, we are going to send the United States into a “mighty sea of coronavirus.”

One of these great subtle statements by the Chinese Communist Party officials about how they are going to leverage key areas of manufacturing to potentially harm our Nation. There is no American who wants to be in that kind of vulnerable position, and that is exactly what happened.

And it is something that we need to wake up to, and I am very pleased with my colleague, Senator Baldwin, to be focusing on these issues. I think one of the areas that we need to be focusing on, and I certainly want the witnesses to expound upon that, is

leveraging Manufacturing USA in the manufacturing extension partnership programs, not just in the traditional areas of manufacturing in the United States, but in all parts of our country. Certainly as a Senator from Alaska, I am interested in that.

We have over 1,000 manufacturers that utilize the Manufacturing Extension Partnership Center to improve their businesses, but we want to be able to see how, in what way we can expand that.

But at the end of the day, what I am really interested in, particularly hearing from our witnesses, is the ability of the United States to bring back manufacturing and be less reliant, particularly on countries that I view as not only competitors, but in many ways adversaries, China being the number one in that category.

So I look forward to hearing from the witnesses. I again want to thank my colleague, Senator Baldwin, the Chair of this Subcommittee, on calling this hearing. And I really believe this is a strong area of bipartisan support that we can make a lot of progress on in the upcoming Congress, that unites Americans on areas that we all really care about, good paying jobs, strong economy, strong national security, and we need to do that.

So thank you again, Madam Chair, and I look forward to the witnesses' statements.

Senator BALDWIN. Well, thank you, Ranking Member Sullivan. I want to start by introducing today's witnesses. Today's witness panel brings broad and deep knowledge of manufacturing and innovation to this hearing. I am so appreciative of all of you taking the time to come here and attend.

Ms. Carrie Hines is the President and CEO of the American Small Manufacturers Coalition, an association of the Nation's manufacturing extension partnership centers.

Dr. Kelvin Lee is an Institute Director for the National Institute for Innovation in Manufacturing Biopharmaceuticals, a Manufacturing USA institute. He is also the Gore Professor of Chemical and Biomolecular Engineering at the University of Delaware.

Dr. David Vasko is the Senior Director of Advanced Technology at Rockwell Automation, based in Milwaukee, Wisconsin. He is also a member of the Commerce Department's Visiting Committee on Advanced Technology.

Dr. Sujai Shivakumar, am I close? Shivakumar. OK. Is Director of the Renewing American Innovation Project at the Center for Strategic and International Studies. The project aims to restore and maintain the United States' leadership in science, technology, and innovation.

And last but certainly not least, Mr. Todd Zakreski is the President of HUSCO Automotive, based in Waukesha, Wisconsin. Additionally, as the Board Chair of the Wisconsin MEP, Mr. Zakreski's knowledge and advocacy have been invaluable to me in my work supporting Wisconsin manufacturers.

Thank you again all for being here. And I am going to turn it over to Ms. Hines for her testimony, and then we can proceed along the line, not necessarily in the order that I introduced all of you. Go ahead, Ms. Hines.

**STATEMENT OF CARRIE HINES, PRESIDENT AND CEO,  
AMERICAN SMALL MANUFACTURERS COALITION**

Ms. HINES. Thank you. Thank you so much for the opportunity to testify today, and for focusing on the vitally important issue of promoting and investing in American small manufacturers.

As you said, my name is Carrie Hines and I am the President and CEO of the American Small Manufacturers Coalition, the trade association of the Nation's manufacturing extension, or MEPs, centers and partners. The NIST MEP program is a Federal public, private partnership managed by NIST that provides small, medium sized manufacturers technology based services through not for profit organizations located in every state and Puerto Rico.

MEP's role in the manufacturing industry is critical to the Nation's security and economic prosperity. MEP works with more than 34,000 manufacturers annually, 79 percent of which have fewer than 100 employees.

In the most recent surveyed year, MEP helped these clients create and retain \$14.4 billion in sales and more than 125,000 jobs. These incredible impacts result in a 13.6 to 1 return to the Federal treasury.

The CHIPS and Science Act included new authorities to expand the MEP program by providing additional expansion awards above and beyond the center's based funding. These expansion awards give the centers the flexibility they need to help rebuild and modernize our industrial capacity.

They allow the MEP centers to provide services to small manufacturers to benefit the manufacturing industry and the Nation as a whole, but that are difficult for small manufacturers to invest in individually—services such as workforce programs, supply chain intelligence and connections, and technology applications, including cybersecurity.

The U.S. manufacturing industry faces three primary workforce challenges, recruiting enough workers, training new workers, and upskilling current workers so that they can adopt state-of-the-art capabilities. MEP centers have done this for decades by leveraging existing state and local resources.

But the new authorities allow centers to combine their efforts, share best practices and resources, and leverage each other's investment to scale up workforce programs nationwide. These programs include raising awareness about manufacturing careers among K-through-12 students and young adults, apprenticeships, and even manufacturing training programs for prisoners, and teaching workers new skills such as using artificial intelligence, smart manufacturing tools including robots and cobots, and how to follow new industry safety rules and regulations.

Small manufacturers are vital to domestic supply chains. MEP plays a critical role in ensuring they remain resilient and competitive. During the pandemic, America depended on its manufacturers more than ever before, and our manufacturers rose to the occasion, displaying unprecedented agility and innovation in extremely difficult circumstances.

Nevertheless, the pandemic highlighted two critical supply chain needs: maximizing the Nation's domestic manufacturing capabilities and enhancing resilience with risk mitigation. The pandemic,

natural disasters, and recent international conflict have shown how critical supply chains are in bringing products to market. MEP centers across the country help maximize small manufacturers capabilities.

For example, in the pandemic, MEP centers helped manufacturers retool to provide needed PPE, such as helping clothing manufacturers shift to make masks, and distilleries retool to make hand sanitizer, which may be why they said it smelled like tequila. They also find domestic suppliers.

Recently, in the wake of Hurricane Ian, in just 6 hours, the MEP National Network helped a Florida-based nonprofit organization find critical supply—critical ventilator supplies to stock field hospitals and clinics in just 6 hours.

In addition to the CHIPS and Science Act, the Inflation Reduction Act and the Infrastructure Investment and Jobs Act provide tremendous opportunities for small manufacturing supply chain, particularly in the energy sector.

Each piece of legislation intends to enhance domestic manufacturing, bring back critical industries, or foster an environment to enhance and support new industries, which are essential for homeland security and national defense.

The success of these bills is dependent on a properly skilled workforce and robust domestic supply chain that includes small manufacturers. It is critical that Congress promote and invest in small manufacturers by expanding its investment in MEP to support it.

An area of increased concern is small manufacturers' vulnerability to cyber-attacks. Manufacturers of all sizes are relying more on data, information, and technology. The biggest challenges that small manufacturers face in implementing effective cybersecurity are a lack of resources, and awareness, and time.

MEP centers are ideally suited to address these challenges by acting as a primary source for cybersecurity information and best practices for manufacturers. MEPs already work with small manufacturing clients on a small scale to implement the NIST cybersecurity framework by leveraging other state and local programs and incentives.

The CHIPS and Science Act provides financial assistance for MEP to expand these services for both awareness and implementation through the Expansion Work Program. The MEP National Network has made an indelible impact on the small manufacturing community over its nearly 35 year history.

Thanks to the CHIPS and Science Act, MEP is positioned to take the U.S. manufacturing industry to the next level. Given its reach, connectivity, and impact, this cannot be done without increased Federal funding to implement the new expansion award authority.

Thank you.

[The prepared statement of Ms. Hines follows:]

PREPARED STATEMENT OF CARRIE HINES, PRESIDENT AND CEO,  
AMERICAN SMALL MANUFACTURERS COALITION

Thank you for the opportunity to testify today, and for focusing on the vitally important issue of promoting and investing in small American manufacturers. My name is Carrie Hines, and I am the President and CEO of the American Small Manufacturers Coalition (ASMC), the trade association of the Nation's manufacturing

extension agents or Manufacturing Extension Partnership (MEP) centers and partners.

### **The Manufacturing Extension Partnership Program**

The MEP program is a Federal public-private partnership that provides small-and medium-sized manufacturers (SMMs) technology-based services they need to thrive in today's global economy and create good-paying manufacturing jobs. MEP is managed by the National Institute of Standards and Technology (NIST) and implemented through a network of industry-led centers located in every state. MEP centers are not-for-profit corporations that employ industry experts who work directly with manufacturers. MEP's role in the manufacturing industry is critical to national security and the Nation's economy. Manufacturing is one of our country's greatest economic strengths, producing more than 11 percent of GDP.<sup>1</sup> Nearly 99 percent of manufacturing firms in America are considered small, with fewer than 500 employees.<sup>2</sup>

As a public-private partnership, MEP delivers a high return on investment to taxpayers. The Upjohn Institute for Employment Research conducted a study of MEP in 2020 and found that the program generates a 13.6:1 return on investment.<sup>3</sup> According to an annual survey conducted by an independent firm, in 2021 MEP clients reported \$14.4 billion new and retained sales and the creation or retention of 125,746 jobs.<sup>4</sup> Considering that the average U.S. manufacturing worker earned \$95,990 in wages and benefits in 2021, MEP clients are economic drivers in their communities.<sup>5</sup> MEP clients are also increasing their capacity for the production of goods. Since 1988, "MEP played a critical role in supporting the U.S. economy and worked with over 132,400 manufacturers, leading to \$138.8 billion in new sales, \$26.2 billion in cost savings and helped create and retain over 1.45 million jobs."<sup>6</sup>

### **CHIPS and Science Act Expansion Awards**

Growing and expanding the MEP program is essential as a matter of national security and economic prosperity. The CHIPS and Science Act included new authorities to expand the MEP program by providing additional "expansion awards" above and beyond a Center's base funding. These awards would enable Centers to provide expanded services in critical areas such as workforce, supply chain, advanced manufacturing, and cybersecurity. The expansion awards give the Centers the flexibility they need to help rebuild and modernize our industrial capacity.

The new authorities help MEP provide services to small manufacturers that benefit the manufacturing industry and the Nation as a whole, but that are difficult for manufacturers to budget for because they do not directly impact each individual manufacturer's bottom line—services such as workforce programs, supply chain intelligence/connections, and technology application. Because these capabilities are important for the country to develop, and because manufacturers are not in a position to invest in them individually, it is appropriate that the CHIPS and Science Act enabled MEP to invest in these areas and for that investment to be exempt from MEP's ordinary cost-share requirements.

### **Workforce**

The U.S. manufacturing industry faces three primary workforce challenges: recruiting enough workers, training new workers, and upskilling current workers so that they can adapt to state-of-the-art capabilities. MEP Centers have been addressing each of these challenges in their work with small and medium manufacturers across the country for decades by leveraging existing state and local resources. But the new authorities allow the Centers to combine their efforts, share best practices and programmatic resources, and further leverage each other's investment to scale-up workforce programs nationwide.

<sup>1</sup> See NIST, "Facts About Manufacturing Infographic," available at <https://www.nist.gov/mep/manufacturing-infographics/facts-about-manufacturing>.

<sup>2</sup> See National Association of Manufacturers, "Facts About Manufacturing," available at <https://www.nam.org/facts-about-manufacturing/>.

<sup>3</sup> See "The National-Level Economic Impact of the Manufacturing Extension Partnership (MEP): Estimates for Fiscal Year 2020," at 2.

<sup>4</sup> See NIST, "MEPNN FY21 Impacts Overview," available at [https://www.nist.gov/system/files/documents/2022/02/15/MEPNN%20FY21%20Impacts%20Overview\\_FINAL-508.pdf](https://www.nist.gov/system/files/documents/2022/02/15/MEPNN%20FY21%20Impacts%20Overview_FINAL-508.pdf), at 1.

<sup>5</sup> See National Association of Manufacturers, "Facts About Manufacturing," available at <https://www.nam.org/facts-about-manufacturing/>.

<sup>6</sup> NIST, "National Institute of Standards and Technology: National Technical Information Service Fiscal Year 2023 Budget Submission to Congress," available at <https://www.commerce.gov/sites/default/files/2022-03/FY2023-NIST-NTIS-Congressional-Budget-Submission.pdf>, at p. NIST-123.

According to MEP client survey data, 63 percent of small and medium manufacturers report that employee recruitment was one of their top three business challenges in 2021.<sup>7</sup> MEP Centers address the Nation’s manufacturing industry recruiting challenge in several ways. Centers educate K–12 students about manufacturing and build awareness among students and young adults about high-quality careers available in manufacturing. Centers also help manufacturers develop videos and other recruiting materials to help them raise their profiles in the local job market.

Training is another key way that MEP Centers address the industry’s workforce challenges. A pre-COVID Deloitte report predicted that “over the next decade nearly 3½ million manufacturing jobs likely need to be filled. The skills gap is expected to result in 2 million of those jobs going unfilled.”<sup>8</sup> If anything, the situation is worse post-COVID. Many job seekers lack the basic employability and mechanical aptitude necessary for manufacturing employment. MEP Centers promote high school manufacturing apprenticeships, develop curricula with community colleges for manufacturing credential programs, engage in virtual reality-based manufacturing training, and provide manufacturing training in prison to prepare incarcerated individuals to return to society with valuable skills.

Because the industry evolves rapidly, upskilling current employees is vitally important. SMMs need new and upskilled workers with training in “Industry 4.0” advanced manufacturing and technology (particularly as American-made manufacturing grows under recent Federal legislation and initiatives), while at the same time a new generation of workers needs better training and skills, particularly individuals most impacted by industrial and service sector changes, coal community decline, and post-COVID employment disruptions. MEP Centers help manufacturers train employees in a wide variety of cutting-edge technologies, such as: using artificial intelligence to maximize the value of the data generated by smart manufacturing tools; using machine learning to baseline equipment performance, identify and alert machine abnormalities; training employees on new safety rules and regulations; and operating 3D printers and other advanced tools.

### Supply Chain

During the pandemic, America depended on its manufacturers more than ever before—and our manufacturers rose to the occasion, displaying unprecedented agility and innovation in extremely difficult circumstances. Nevertheless, the pandemic highlighted two critical supply chain needs: first, maximizing the Nation’s domestic manufacturing capabilities, especially for critical products; second, enhancing resilience by identifying and eliminating single points of failure. With additional CARES Act funding of \$50 million, MEP Centers were able to serve 5,396 manufacturers with 7,506 projects. Of these manufacturers, nearly half had never worked with MEP before. The Alaska MEP Center, for example, helped match those in need of PPE with over 70 local manufacturers producing PPE and helped a number of Alaskan manufacturers covert their operations to produce PPE.

The pandemic, natural disasters and recent international conflict also brought to light the criticality of supply chains in bringing products to market. MEP’s unique National Network and reach to the Nation’s small manufacturers puts it in prime position to help mitigate risk and respond to the industry’s needs, sometimes with just hours’ notice. Recently, FloridaMakes (Florida’s MEP Center) received an urgent request for defibrillators and related accessories needed to stock field clinics and hospitals in the Southwest Florida region in the wake of Hurricane Ian. FloridaMakes immediately forwarded the request to MEP Centers nationwide and within hours, MassMEP (Massachusetts’s MEP Center) located a Massachusetts-based supplier who could provide the parts needed. Within just 6 hours of receiving the request, a \$1.9 million contract was signed and executed between the Florida non-profit establishing the field clinics and the Massachusetts-based manufacturer. It is no exaggeration to say that the MEP National Network played a critical role at a time of great need for the people of Florida.

The CHIPS and Science Act includes authority for a Supply Chain Database, funding for which can be provided through Expansion Awards. The database will help MEP realize its full potential as a nationwide manufacturing supply chain intelligence network.

Hydraulic.net, a Florida-based manufacturer and distributor of hydraulic pumps and other components for agriculture equipment, had been sourcing some cast-iron

<sup>7</sup> See “MEPNN FY21 Impacts Overview,” [https://www.nist.gov/system/files/documents/2022/02/15/MEPNN%20FY21%20Impacts%20Overview\\_FINAL-508.pdf](https://www.nist.gov/system/files/documents/2022/02/15/MEPNN%20FY21%20Impacts%20Overview_FINAL-508.pdf), at 1.

<sup>8</sup> “The Skills Gap In Manufacturing, 2015 and Beyond,” <https://www.themadeinamericamovement.com/wp-content/uploads/2017/04/Deloitte-MFG-Institute-The-Skills-Gap-in-the-US-MFG-21015-and-Beyond.pdf>, at 2.

and steel parts from a supplier in the Kharkiv region of Ukraine, and was forced to scramble for new sources once Russia invaded in February 2022. Florida's MEP Center looked for sources in Florida and was not able to identify any appropriate casting suppliers that met their needs, but the Center used a national supply chain platform to link the manufacturer with casting houses in Illinois and Indiana. As a result, they were able to source their castings domestically.

To help U.S. manufacturers comply with Buy American requirements, the MEP National Network connects them to domestic suppliers through its Supplier Scouting service, which leverages MEP's extensive nationwide supplier relationships and knowledge of U.S. manufacturing capabilities. The Wisconsin Center for Manufacturing & Productivity helped Northstar Medical Radioisotopes work within the structures of the Buy American policy to bring domestically manufactured, environmentally sound molybdenum-99 (Molly 99) to the U.S. market. Molly 99 is critical for medical imaging and diagnosis—and is traditionally sourced from foreign producers. Northstar Medical Radioisotopes used a cooperative agreement from the DoE to develop a new approach to manufacture this critical material. The MEP in Wisconsin helped the company negotiate the Buy American requirements and connect it to new medical markets.

### **Energy**

In addition to the CHIPS and Science Act, the Inflation Reduction Act and the Infrastructure Investment and Jobs Act provide tremendous opportunities for the small manufacturing supply chain, particularly in the energy sector. Commitments at every level of American government plus robust market forces are bringing increasing demand for manufactured goods and innovative technologies for a "new energy economy" in the sectors of renewable energy, hydrogen power, low-carbon power, smart grid improvements, green buildings, electric vehicles, energy efficiency, and other smart energy and reduction innovations.

While the opportunities for manufacturing, supply chain expansion, and good jobs are tremendous, the challenge is that most SMMs are based in traditional industry sectors, far behind the curve on green manufacturing and smart energy approaches, disconnected from new energy economy supply chains, unaware about how new Federal stimulus programs will operate, and lacking a skilled workforce to fulfill these emerging markets. For example, the Illinois Manufacturing Excellence Center (the Illinois MEP Center) has 17 U.S. Department of Labor registered apprenticeships, including four focused on jobs in for the electric vehicle supply chain. There is a need to rapidly expand these types of rigorous and industry-relevant training models, which can be accomplished through the Expansion Award program. Busy manufacturers do not have the time or capacity to harness these new energy economy opportunities alone, and need robust technical assistance to get there.

MEP provides that technical assistance through the programs described above. There is a key opportunity now to ensure that the new energy economy's technologies and products are manufactured by workers in America. The MEP Centers across the U.S. will help manufacturers navigate the new energy economy, enter new supply chains, retool factories, and make the parts and products needed for a diverse clean energy economy—all while ensuring that the future of manufacturing is cleaner and energy smart.

### **Advanced Manufacturing Services**

The MEP program is uniquely positioned to make significant advances in manufacturers' implementation of advanced technology given the program's national reach. National labs, manufacturing institutes and higher education's technology labs do a great job of creating advanced technology and research but lack the national reach that the MEP program possesses to get that technology to industry. The expanded authority in the CHIPS and Science Act would allow MEP Centers to bring that technology and research to the manufacturer by partnering with technology demonstration labs to showcase how technology can be applied to improve manufacturing processes, increasing the industry's competitiveness on a manufacturer-by-manufacturer level. The MEP National Network's comprehensive coverage enables this to take place on a truly national scale.

### **Cybersecurity**

An area of increased concern is small manufacturers' vulnerability to cybersecurity attacks. Manufacturers of all sizes are relying more on data, information and technology to operate their business, all of which can leave them vulnerable to cyber attacks. The biggest challenges that small manufacturers face in implementing effective cybersecurity are a lack of awareness, time, and resources. MEP Centers are ideally suited to address these challenges by acting as the primary source for cybersecurity information and best practices for manufacturers. MEP Centers already

work with small manufacturing clients to implement the NIST cybersecurity framework.

For example, since about 80 percent of the work at Michigan-based Linear Motion is for the Department of Defense (DoD), it was imperative that the company follow DoD's requirements to achieve Cybersecurity Maturity Model Certification (CMMC). The Michigan Manufacturing Technology Center conducted a cybersecurity assessment of its requirements to comply with the Defense Federal Acquisition Regulation Supplement (DFARS) and implementation of NIST 800-171. The Center then conducted several days of mentoring to help Linear Motion satisfy the necessary requirements to successfully reach CMMC Level 3. As a result, Linear Motion retained \$16,000,000 in sales and 128 retained jobs. MEP's work in cybersecurity has been recognized in past NDAA legislation authorizing the DoD to provide financial assistance to expand that capacity.

The CHIPS and Science Act provides financial assistance for MEP to expand these services for both awareness and implementation through the Expansion Award program.

### **Conclusion**

The MEP National Network has made an indelible impact on the small manufacturing community over its nearly 35-year history. Thanks to the CHIPS and Science Act, MEP is positioned to take the U.S. manufacturing industry to the next level given its reach, connectivity and impact. This cannot be done without increased Federal funding to implement the new Expansion Award authority.

The CHIPS portion of the bill will challenge the American small manufacturing community to provide a properly skilled workforce and robust supply chain in support of increased semiconductor manufacturing. This challenge can become an opportunity for small manufacturers, if they are properly prepared. With Expansion Award authority and funding, the MEP National Network can provide on a national scale the services that the Nation's small manufacturers need.

Senator BALDWIN. Thank you, Ms. Hines. Next, Dr. Lee.

**STATEMENT OF DR. KELVIN H. LEE, PH.D.,  
INSTITUTE DIRECTOR, NATIONAL INSTITUTE FOR  
INNOVATION IN MANUFACTURING BIOPHARMACEUTICALS,  
GORE PROFESSOR OF CHEMICAL AND BIOMOLECULAR  
ENGINEERING, UNIVERSITY OF DELAWARE**

Dr. LEE. Chair Baldwin, Ranking Member Sullivan, distinguished members of the Subcommittee, good afternoon. I am honored to be here. My name is Kelvin Lee, Institute Director at NIIMBL, the National Institute for Innovation in Manufacturing Biopharmaceuticals, a Commerce-sponsored manufacturing innovation institute, and one of 16 current institutes in the Manufacturing USA network.

Manufacturing is central to America's economic power and national security, and historically, we have led the world in the invention of and manufacturing of advanced technologies. However, we have lost our leadership position in manufacturing over the past two decades, and this is a threat to our economic prosperity and national security.

We invent things here, but we make them elsewhere and import them. Manufacturing USA Program's purpose is to ensure our global competitiveness and advanced manufacturing innovation in jobs. It comprises 16 large public, private partnerships in different technology sectors.

Each is a pre-competitive ecosystem, advancing the development of technologies and a skilled workforce. Small companies, who are the heart of innovation for so many industries, work inside institutes to push technologies across that valley of death from proof of concept into commercial products.

Institutes also include State and local governments, MEP centers, community colleges, universities, companies within the supply chain, and end user manufacturing companies selling everything from semiconductors to airplanes to biopharmaceuticals, just to name a few. Today, more than 2,300 organizations based in all 50 states have joined at least one of the 16 institutes.

Let's talk about NIIMBL for a minute. Our unique sector focus is biopharmaceutical manufacturing, the technologies and workforce needed to leverage the power of biology to make lifesaving medicines.

Biopharmaceuticals include everything from therapeutic proteins that treat autoimmune diseases to the latest cell therapies that some see as a cure for cancer. While the U.S. is an R&D leader in this space, the U.S. biopharma trade deficit went from \$3.5 billion in 2000 to more than \$85 billion in 2020, just two decades later.

We invent biopharmaceuticals here and then we import them from Ireland, Switzerland, Singapore, and other countries. NIIMBL is focused on helping small U.S. companies grow and helping big companies meet their technology needs through precompetitive MEP collaboration.

We do this by advancing paradigms such as continuous manufacturing, by developing and deploying workforce training programs around the country. Speaking of workforce, we cannot meet our global competitiveness challenges of today by advancing technology alone.

All Americans should have an opportunity to gain the skills needed to work in advanced manufacturing careers in factories near their communities, something that is the heart of a resilient economy. And workforce development needs aren't only a concern for large companies.

Small companies need skilled, agile workforce. Even the U.S. Government would benefit directly and indirectly from people acquiring industry relevant manufacturing skills. America's longstanding ability to meet and overcome any crisis is really rooted in a spirit of innovation, manufacturing capability, and a people with skills and a commitment to succeed.

With more technologically advanced competitors, we need a strategic set of policies that ensure our national security, economic health, and energy security. And I have four suggestions, described in more detail in my written testimony, to offer.

First, Manufacturing USA is an established, effective, and proven program promoting U.S. competitiveness. It has a 2.8 to 1 private sector co-investment for every Federal dollar and a substantial untapped potential. I urge this subcommittee to work with appropriators to ensure that there are resources to better support all of the institutes, and ensure that new initiatives build upon successes, maximize coordination, and minimize duplication.

Second, as technologies mature in an institute, they must be demonstrated in a production relevant environment, yet there are few, if any, such facilities available. Scale up infrastructure would support small companies advancing technologies and could provide the U.S. with a world leading workforce training capability.

I recommend the Subcommittee authorize DOC to fund the creation of specialized research and testing facilities. Third, any man-

ufacturing innovation strategy without an emphasis on workforce development is going to fail. Public interest in manufacturing careers lags because of the perception that manufacturing is done in dirty, dark, and dangerous environments when in fact it is really done today in environments that are clean, cool, and quiet.

The U.S. Government has the resources and the power to correct this perspective, so I recommend the Subcommittee explore ways to expand institute workforce development programs, including a national campaign to promote manufacturing careers to all Americans.

Finally, I want to urge the Subcommittee to find ways to more widely implement the use of other—of existing other transactional authorities to contract with Commerce-sponsored institutes. Because contracting vehicles such as cooperative agreements can create some disincentives to companies, especially small companies, from engaging with institutes. I want to thank you for the opportunity to share my perspective.

Our country's significant investment in early stage research, together with an entrepreneurial and innovative mindset and a skilled workforce, made us the greatest country in the history of the planet. But the world is changing, technologies are advancing, and other countries are implementing policies that have eroded our leadership.

So as Marv Levy, Hall of Fame, NFL Coach of the Buffalo Bills from the 80s and 90s is attributed to have said, "if you don't change with the times, the times are going to change you."

[The prepared statement of Dr. Lee follows:]

PREPARED STATEMENT OF DR. KELVIN H. LEE, PH.D., INSTITUTE DIRECTOR,  
NATIONAL INSTITUTE FOR INNOVATION IN MANUFACTURING BIOPHARMACEUTICALS,  
GORE PROFESSOR OF CHEMICAL AND BIOMOLECULAR ENGINEERING,  
UNIVERSITY OF DELAWARE

### Introduction

Chair Cantwell, Ranking Member Wicker, Chair Baldwin and Ranking Member Sullivan, and distinguished members of the subcommittee good afternoon. I am honored, and humbled, to be invited to share a perspective on the some of the important Department of Commerce investments and policies that help small and medium sized manufacturers compete effectively in today's global marketplace. Thank you for the opportunity to be with you today.

My name is Kelvin Lee. I am the Institute Director at NIIMBL, the *National Institute for Innovation in Manufacturing Biopharmaceuticals*, a Department of Commerce-sponsored manufacturing innovation institute. NIIMBL is one of 16 current institutes in the Manufacturing USA Network. NIIMBL's unique sector focus is on biopharmaceutical manufacturing innovation—the technologies and workforce needed to leverage the power of biology to make life-improving and life-saving medicines. Biopharmaceutical medicines include everything from therapeutic proteins and antibodies that treat autoimmune and neurodegenerative diseases, as well as the latest cell therapies that some see as cures for pediatric cancer, in addition to gene therapies where a single dose of medicine can be the difference between a normal life or several difficult years for a newborn child ultimately resulting in death from a motor neuron disease.

### American Manufacturing and the Manufacturing USA Program

Manufacturing is central to America's economic power and national security. It accounts for about 11 percent of the gross domestic product<sup>[1,2]</sup> and employs almost

<sup>[1]</sup><https://data.worldbank.org/indicator/NV.IND.MANF.ZS>

<sup>[2]</sup><https://www.brookings.edu/research/global-manufacturing-scorecard-how-the-us-compares-to-18-other-nations/>

13 million people in good paying jobs<sup>[3]</sup>. Historically, the U.S. has led the world both in basic research that leads to new technologies, as well as in the manufacturing of high-value advanced technology products such as computer chips, aircraft, and medicines. However, U.S. leadership in advanced technology industries is not guaranteed<sup>[4]</sup> and over the past two decades, our country has lost its leadership position in manufacturing. *I believe this loss of advanced manufacturing leadership is a threat to our economic prosperity and national security.* We invent things here, but they are made elsewhere. I think all of us who have experienced the last two years of limited product availability because of supply chain issues can appreciate the benefits of inventing things here and making things here. I want to emphasize how important it is that we make things here.

The Manufacturing USA Program, authorized by the Revitalize American Manufacturing and Innovation Act of 2014, as amended,<sup>[5]</sup> establishes large-scale public-private partnerships to drive manufacturing innovation for advanced technology products. The purposes of the program include: improving competitiveness of U.S. manufacturing; stimulating U.S. leadership in advanced manufacturing research, innovation, and technology; facilitating the transition of innovative technologies into scalable, cost-effective, and high-performing manufacturing capabilities; facilitating access by manufacturing enterprises to capital-intensive infrastructure; and accelerating the development of an advanced manufacturing workforce; among others.

Each of the Manufacturing USA innovation institutes is a large-scale public-private partnership that creates a precompetitive ecosystem to advance technologies that have already demonstrated proof of concept but have not been matured and de-risked enough to be adopted into commercial manufacturing processes. Many, but not all, of these innovative technologies are being cultivated by small and medium enterprises who must navigate the so-called Valley of Death as they seek financial support to continue to mature their technologies and as they ultimately look for customers or for opportunities to be acquired or go public. *Manufacturing USA institutes are a proven, efficient, and effective model for de-risking and demonstrating these innovative technologies* regardless of whether they are being developed by universities, small companies, or large companies.

The institutes are end-to-end ecosystems for technology and workforce development in advanced manufacturing. They include state and local governments, Manufacturing Extension Partnership Centers, community colleges focused on training the workforce, universities pursuing applied research and pushing technologies into the marketplace, small and medium enterprises advancing their technologies, vendors in the supply chain, and end-user manufacturing companies selling products such as semiconductors, airplanes, biopharmaceuticals, automobiles, or robotics systems, just to name a few.

By working inside a Manufacturing USA institute, small companies can receive non-dilutive funding to collaboratively advance and demonstrate their technology. Small companies can work with big companies that may be future customers, they can work with large suppliers who may be interested to acquire the technology, and they can work with academic and government scientists to understand and improve the technology. Academic institutions can ensure that workforce training programs are aligned with industry needs and that new research discoveries, often funded by various U.S. Government research agencies, can be developed into valuable products for society. Large companies can de-risk new technologies in a shared, precompetitive arena accelerating their adoption into new products, processes, and services. And state and local governments pursue their interests for regional economic development and job creation.

Today more than 2300 organizations, based in all 50 states, have joined at least one of the 16 Manufacturing USA innovation institutes, of which 63 percent are manufacturing firms and over 1000 are small to medium businesses<sup>[6]</sup>. To give a sense of the scale, in FY 2021 alone, these organizations were actively working on more than 700 technology projects among the institutes and engaged over 90,000 people in advanced manufacturing workforce skills development.<sup>[6]</sup>

The 16 institutes that comprise the Manufacturing USA Network each have one of three primary sponsoring agencies: the Department of Commerce, the Department of Defense, or the Department of Energy. NIIMBL is sponsored by the National Institute of Standards and Technology (NIST) within the Department of Commerce.

<sup>[3]</sup><https://www.nam.org/facts-about-manufacturing/>

<sup>[4]</sup><https://itif.org/publications/2021/11/22/going-going-gone-stay-competitive-biopharmaceuticals-america-must-learn-its/>

<sup>[5]</sup> 15 U.S.C. § 278s

<sup>[6]</sup> <https://www.nist.gov/publications/manufacturing-usa-highlights-report-2022>

**NIIMBL**

I realize that my comments have been at a conceptual level, and I want to share something more specific that speaks to how an institute can function. NIIMBL is focused on biopharmaceutical manufacturing. Unlike traditional small molecule generic medicines which are primarily regulated based on the product itself, biopharmaceuticals are regulated based on the manufacturing process. The biopharmaceutical manufacturing industry is extremely risk averse to implement new manufacturing technologies into their processes because it is difficult to know what questions health authorities may have about how a new technology works. Answering those questions can delay speed to market and speed to patient and as a result, businesses often make decisions to rely on previously accepted approaches rather than newer approaches.

Moreover, companies must navigate a globally diverse environment of regulations—each country’s health authority maintains its own expectations and process for approving medicines. Here in the United States that responsibility rests with the Food and Drug Administration. In Canada the responsibility rests with HealthCanada, in Switzerland the responsibility is with SwissMedic, and so on. An approval to use an updated manufacturing process in one country does not ensure approval in another country and so relying on older existing approaches is a better business decision than employing different manufacturing processes (one conventional and one innovative) to make the same product for use in different countries. As a result, companies tend to choose traditional manufacturing technologies and approaches for which there is broad understanding and experience even if innovative approaches are available. However, once a new manufacturing technology is accepted and adopted somewhere within the industry, other companies are quick to embrace those approaches because they confer improved efficiency, reliability of supply, and other benefits to companies and patients. *Within our community, we talk about the notion that when it comes to manufacturing technologies, companies would rather be a fast second to implement a new technology rather than to be first. By de-risking technologies, our goal at NIIMBL is to have all companies go first together.*

The NIIMBL mission is to accelerate biopharmaceutical manufacturing innovation, support the development of standards to enable more efficient and rapid manufacturing capabilities, and educate and train a world-leading biopharmaceutical manufacturing workforce, fundamentally advancing U.S. competitiveness in this industry<sup>[7]</sup>. While the U.S. is a global R&D leader in this space, U.S. biopharmaceutical manufacturing productivity is 40 percent lower in 2020 than it was in 2006—a bigger drop than any other manufacturing sector [5]. The U.S. biopharmaceutical trade deficit was \$3.4 billion in 2000 and an astonishing \$85.7 billion in 2020—only two decades later<sup>[5]</sup>. Examples of countries that lead in biopharmaceutical manufacturing and workforce development include Ireland, United Kingdom, Germany, Switzerland, and Singapore.

*An example of how NIIMBL works.* One area in which NIIMBL seeks to transform biopharmaceutical manufacturing is in the evolution from batch to continuous processing—an evolution that many other industrial sectors have gone through such as oil refining, metal smelting, paper, automobiles, and foods. The benefits of continuous manufacturing relate to efficiency, flexibility, cost, and speed, among others. The current state of the art commercial monoclonal antibody manufacturing processes are batch processes. Bioreactors are used to grow cells that express an antibody. Those materials are collected, purified, and formulated into vials, IV bags, or syringes. The resulting antibody treatments are targeted for patients with various forms of cancer, autoimmune disorders, metabolic and infectious diseases. It is very likely that every person in this room has either received an antibody treatment or knows someone who has had their life improved, or saved, by such a treatment.

Antibodies can be made by continuous manufacturing. Most of the companies I talk to have demonstrated that capability in their own facilities using their proprietary continuous manufacturing processes. The technology works, yet commercial production is still by batch processing rather than by continuous processing. To move the field forward, NIIMBL brings together diverse companies including drug developers, vendors and suppliers of equipment, small businesses, and academics, to work on a non-proprietary continuous manufacturing testbed. Within NIIMBL, hundreds of subject matter experts from dozens of companies collaborated over the past two years to design a continuous manufacturing process that is generally (but not specifically) the same as the proprietary platforms in the company labs—with the notable exception that the NIIMBL process is shared. Scientists from different

<sup>[7]</sup><https://www.niimbl.org>

companies can work alongside each other and with those from academia and government to turn the proverbial knobs on the equipment to develop a shared understanding of how continuous manufacturing works. They can take those learnings back inside their own companies to gain confidence in this approach. Vendors and suppliers can work on standardized solutions to streamline supply chains. And small companies with innovative technologies can test their technologies in the testbed to show the improvements that can be made.

We see the desire by companies, and by the U.S. Government, to increase domestic biopharmaceutical manufacturing capacity going forward. Our vision for the future of continuous manufacturing is a future where there are smaller, less expensive, more flexible, and more geographically distributed manufacturing facilities. A future where first-generation continuous manufacturing factories are being built in the US, while NIIMBL works on demonstrating second and third generation continuous manufacturing paradigms. This future will result in a more resilient supply of medicines, increased patient access and more and better jobs. Our NIIMBL continuous manufacturing testbed, not to mention 100+ other technology innovation projects at NIIMBL, are going to help us realize this vision.

Neither NIIMBL, nor any of the Manufacturing USA innovation institutes, can meet the global competitiveness challenges of today by advancing technology alone. *Our country must also focus on workforce development.* NIIMBL's workforce development programs are designed to ensure that these new factories, which are ideally geographically distributed around the country, can be staffed by skilled workers who are also located around the country. All Americans should have an opportunity to gain the skills needed to work in this important industry, or in advanced manufacturing careers generally, and all Americans should have access to those opportunities near their communities. Realizing this vision for the American manufacturing worker is vital to having a resilient economy. But workforce development needs aren't only a concern for large manufacturing companies. Small companies need skilled, agile workers; and even the U.S. Government will benefit directly, and indirectly, from a much greater focus and investment on people acquiring industry-relevant manufacturing skills.

#### **Four Considerations for the Future as Opportunities to Improve**

America's long-standing ability to meet and overcome any crisis is rooted in a spirit of innovation, a capability to manufacture, and a people with skills and a commitment to succeed. Multiple global events over the past few years have challenged America's ability to respond rapidly to threats and there are gaps to be addressed to ensure America's national, economic, health, and energy security in the face of such threats and the rise of more technologically advanced competitors. As Chair of the Manufacturing USA Institute Directors Council, I believe we must create a coordinated set of strategic investments, including policy and regulatory updates, that build upon existing institutions, address gaps, and anticipate future needs.

##### *1) Enhance and expand upon the successes of the Manufacturing USA Program.*

The Manufacturing USA Program is an established, effective, and proven program that promotes U.S. competitiveness. Institutes have demonstrated significant amounts (2.8 to 1) of non-Federal co-investment for every Federal dollar<sup>[6]</sup>. However, our investment as a nation for advanced manufacturing innovation is relatively small compared to other countries. Relative to the need, institutes have very limited resources available to support ecosystem development and workforce development for their sectors. For example, the United Kingdom has a similar program called the Catapult Network. Their broad-based initiative includes three institutes that work in the same technical area as NIIMBL. Based on a variety of public sources and press releases, we estimate that the UK government invested about \$1 billion USD for biopharmaceutical manufacturing innovation for the period of 2015 to May 2021. That amount is roughly 12 times more in absolute dollars than the U.S. investment in NIIMBL over that same time period and about 90 times more investment than the U.S. when normalized to GDP. The other Manufacturing USA innovation institutes almost certainly have similar examples. *Other countries want to be the home of global innovation and manufacturing and the U.S. must scale our investments appropriately to ensure our economic and national security.*

Beyond the issue of funding for any single institute, the collection of institutes is intended to serve as a network providing a national competitive advantage. By ensuring complementarity of technology sectors, institutes can collaborate on technologies allowing each ecosystem the ability to bring their own expertise and capabilities to help address each other's needs. For example, CESMII, the Department of Energy-sponsored Smart Manufacturing Institute could provide valuable expertise to support NIIMBL's future vision of continuous manufacturing. As a network,

we have not yet achieved our potential because of resource constraints. Moreover, the authorization of exciting new innovation-centered programs such as DOC's Regional Technology and Innovation Hubs and the NSF's Technology, Innovation, and Partnerships Directorate risks duplication of effort. *I urge the Subcommittee to 1) work with appropriators to ensure there are adequate resources for DOC to provide more support to all institutes for their own work and to collaborate across the network, and 2) ensure new initiatives build upon existing successes, maximize coordination, and minimize duplication.*

*2) Capital Investment in Demonstration Facilities.*

A key gap in U.S. competitiveness relates to manufacturing scale-up infrastructure in this country. Manufacturing USA innovation institutes seek to mature and de-risk technologies to the point of commercial adoption. However, as a technology matures the cost to make such demonstrations also increases, largely influenced by the need to test the technology in real-world manufacturing environments. Such environments have high utilization rates by companies and therefore are not available for testing purposes. Investments to create such infrastructure around the Nation for various sectors, would help Manufacturing USA innovation institutes move technologies from proof of concept all the way through commercial realization. Without such infrastructure, manufacturing technologies may mature to a point, then move overseas for final demonstration and adoption as competitor nations benefit from early-stage U.S. technology development. The ability and investment to establish such specialized research and testing facilities here in the U.S. will support small manufacturers de-risking their technology. It can also be the basis for a national network of workforce training facilities that would provide the U.S. with world-leading workforce training capabilities. *I recommend the Subcommittee consider explicit language authorizing DOC to invest and create such specialized research and testing facilities through the Manufacturing USA Program.*

*3) Advance a National-Scale Manufacturing Careers Campaign and Program.*

I believe that any advanced manufacturing innovation strategy without a clear emphasis on workforce and talent development will fail. Current Manufacturing USA innovation institutes have an incredible range of effective programs that connect people to skills, leading to careers. NIIMBL's eXperience program partners with historically black colleges and universities and other minority serving institutions to introduce students to biomanufacturing careers. Our friends at the DoD-sponsored LIFT institute run Operation Next, an innovative training and credentialing program to transition active-duty soldiers nearing the end of their service into high demand manufacturing fields. The FlexFactor program run by the NextFlex institute is a highly successful STEM outreach program to introduce students to advanced manufacturing technology careers—it's so successful that many other institutes, including NIIMBL, are working to adapt the FlexFactor framework to their own industry sector. Despite these great programs, meeting the workforce needs of today, and tomorrow, can't be done by inspiring or training on a local level alone. The U.S. needs a significant upgrade in how we think about manufacturing careers. The impression of dirty, dark, and dangerous environments still persists, even though, for example, a biopharmaceutical manufacturing facility is clean, cool, and quiet. Only the U.S. Government has the resources and power to change this perspective rapidly. Without such a change, and an available and ready workforce, companies will continue to build their factories where they can get talent and that poses risks to our competitiveness. I understand that solutions to this important question are both within the Committee's jurisdiction and might also require collaboration with others. *I recommend the Subcommittee explore ways to significantly expand advanced manufacturing workforce and talent development programs by Manufacturing USA institutes including a national campaign to promote manufacturing careers that would be available to all Americans.*

*4) OTAs: Ensuring Efficient and Effective Use of Federal Resources Aligned with the Goals.*

Across the 16 institutes, there are a variety of contracting vehicles that have been used by the Department of Commerce, Department of Defense, and Department of Energy to work with the institutes. Some of these vehicles are Cooperative Agreements and others rely on Other Transactional Authority (OTAs). The industry-led nature of the work of the institutes, including an emphasis on working with small manufacturers to advance their technologies, is well-aligned with the concept of OTAs which were established as ways to permit Federal agencies to work with non-traditional contractors and small businesses to prototype and advance technologies and allow close collaboration between the Federal agency and the partner. Our experience is that the use of Cooperative Agreements is not as efficient nor effective

for working within ecosystems as large as a Manufacturing USA innovation institute such as NIIMBL, and its use can create disincentives to participation by companies. *I urge the Subcommittee to find ways to have the DOC Manufacturing USA Program adopt the use of existing other transactional authority for DOC-sponsored institutes to facilitate enhanced interactions between institutes and small and large businesses.*

### **Conclusions**

I am grateful to have the opportunity to share my perspective on American manufacturing, the role of small to medium enterprises, Manufacturing USA, and our global competitiveness. Our history as leaders of research and development of advanced technologies and a domestic capability for manufacturing those technologies was no accident. Our country's significant investment in early-stage science and technology together with an entrepreneurial and innovative mindset, and a skilled and capable workforce made us the greatest nation in the history of the planet. However, the world is changing, technologies are advancing, and other countries are investing and implementing policies that have eroded our leadership position. *We must not wait!*

As Marv Levy, Hall of Fame NFL coach of the Buffalo Bills from the 1980s–90s, is attributed to have said: “If you don’t change with the times, the times are going to change you”.

**Additional Written Testimony provided by Kelvin H. Lee in response to a question to learn more about the Operation Next Program run by LIFT – a Manufacturing USA innovation institute.  
27 December 2022**



**Operation Next® - LIFT**

An innovative training and credentialing program with a success rate of over 90 percent, Operation Next® provides a blended learning curriculum to active-duty soldiers within their last six months of service, plus National Guard and Reserve members and their immediate family members, enabling them to earn nationally portable, standards based, industry recognized credentials in high-demand manufacturing fields.

Over 200,000 Service members transition out of the military annually and this demographic can be prepared with critically needed technical skills, adding to the skills they acquired through service. Additional targeted training enables the Service member to seamlessly transition into a civilian career, often in an industry that supports National security. This pathway embodies a powerful solution to bridging the manufacturing skills gap.

Operation Next, currently funded through the Department of Defense Manufacturing Engineering Education Program, enrolls hundreds of Service members nationally. This competency-based program features a hybrid curriculum, allowing service members to learn the theory online through simulations and multimedia and then demonstrate their new skills on real world manufacturing equipment. Upon completion of Operation Next, Service members are prepared to earn nationally portable, industry recognized credentials and secure a job in one the most in-demand advanced manufacturing fields.

Operation Next currently offers certifications in welding, computerized Numerical control (CNC) machining, industrial technology maintenance, and robotics.

After a successful pilot at Fort Campbell, Operation Next has continued to grow across the country. The program is currently available in 14 locations, including in Alabama, Florida, Georgia, Kentucky, , Michigan, Montana, New York, North Carolina, Virginia, Washington, Hawaii, Wisconsin and Puerto Rico.

Additionally, Operation Next recently completed a pilot for the civilian workforce, focused on those people and small and medium-sized manufacturers impacted by the COVID-19 pandemic in both Detroit and Pittsburgh. That pilot was funded through the Coronavirus Aid, Relief, and Economic Security (CARES) Act, and awarded to LIFT by the U.S. Commerce Department's National Institute of Standards and Technology.

Operation Next is shovel-ready to receive additional funding to expand to our veterans across the country as a solution to the growing advanced manufacturing skills gap.

**For additional information please contact:**

Nigel Francis, CEO LIFT (nfrancis@almmii.org)

Joe Steele, Senior Director Communications and Legislative Affairs LIFT (jsteele@almmii.org)

Senator BALDWIN. Thank you, Dr. Lee. And now Mr. Zakreski.

**STATEMENT OF C. TODD ZAKRESKI, PRESIDENT, HUSCO  
AUTOMOTIVE LLC AND BOARD CHAIR, WISCONSIN  
MANUFACTURING EXTENSION PARTNERSHIP (WMEP)**

Mr. ZAKRESKI. Thank you. Good afternoon, Chair Baldwin and Ranking Member Sullivan. Thank you for the opportunity to testify about the role of small and medium sized enterprises in advancing domestic manufacturing, and the potential support that the Commerce Department can provide through its manufacturing extension partnership.

I am President of HUSCO Automotive, a medium sized, minority owned, Wisconsin based, global manufacturer of highly engineered hydraulic and electromagnetic controls for current and new automotive propulsion systems.

I am also the current Board Chair of the Wisconsin Manufacturing Extension Partnership, providing me the unique position of being both an MEP consumer, and directly connected witness to the exceptional value and return on investment that the MEP system delivers to America's SMEs.

My first experience with the WMEP was in my current role at HUSCO. And prior to joining the WMEP board, 5 years ago, HUSCO embarked on a venture to design and build our own advanced manufacturing equipment. As we developed into becoming our own integrator, we decided also we wanted to help small manufacturers in Wisconsin solve their manufacturing challenges.

The WMEP provided multiple manufacturing specific programs and venues for us to introduce our capabilities and competencies to just such a group. We connected with a small manufacturer in need of solving a complicated packaging problem that was difficult for the operator to execute by hand, making a three shift per day, 5 days a week task frustrating and physically unpleasant.

The issue was also creating internal capacity constraints causing lost sales and profits. Our advanced manufacturing group established a unique solution that eliminated the need for the operator to execute the specific task. We built the machine, introduced it to their shop floor, and successfully eliminated the problem.

The small manufacturer, with the help of the WMEP, secured training for the operator such that he gained new skills associated with providing technical support and maintenance for this and several other production equipment machines on their factory floor.

As simplistic of an example that this specific engagement represents, it was a powerful statement across several areas pertaining to key elements of the MEP mission. And sometimes it is the simplest success stories that carry the most insight into the way forward.

First, through their targeted technology and services programs and statewide manufacturing events, they introduced a small manufacturer to local sources of relevant advanced manufacturing technology and integration.

Second, they facilitated the development of a machine operator such that he could step into a more value adding role for both the company and for his overall personal situation. I share this story because it represents how two SMEs, one with an advanced manu-

facturing solutions capability, connected and collaborated through the MEP system, and advancing the state of manufacturing the common good, developing a workforce such that both the business and the worker realize a positive outcome.

To be globally competitive—and no, strike that, to be the clear global leader of the most advanced technologies and manufacturing processes in the world, we must embrace and grow organizations like the MEP, who onboard some of the best talent across all aspects of manufacturing, leveraging their many years of expertise in their respective areas to help guide their SMEs and ultimately all of America's manufacturers toward that goal.

The MEPs are perpetual drivers of innovation in product and process. They have mastered how to couple that with helping how to find the right paths of development for the workforce. The link between onboarding advanced technologies and processes and connecting SMEs with the right training for its workforce, is an especially important attribute of the MEP expertise portfolio that I wanted to highlight here for you today.

Another area I would like to touch on is supply chain. HUSCO Automotive has experienced its own share of challenges in securing material from overseas and has been working hard over the last 3 years to move parts to local sources. As Board Chair of the WMEP, I have had the opportunity to see several engagements that have solved supply chain problems.

Help us find a source for this part in the United States as we can no longer afford supply chain delays from overseas sourcing due to volatility in freight schedules, international shipping costs, and political unrest is a common ask of our consultants. The MEP system is a natural leader to help solve this problem.

As more and more MEP engagements occur, America's SMEs will become the best global solution for supply. In fact, it is happening already. At the WMEP, I have seen multiple SME manufacturers that we have engaged with grow their sales by 15 percent plus and becoming that onshore solution thanks to the process and improvements and new investments in advanced manufacturing technology and workforce development, all guided by WMEP consultants.

With more success stories like these, which I have witnessed at the WMEP, we will be able to move even more quicker in getting SMEs to play a bigger role being that onshoring solution. An additional benefit to these types of MEP engagements that will also come out of the proposed CHIPS Act MEP investment, there will be a national database of suppliers that will be available for MEPs, system wide access and use to help identify high potential local source options, facilitating fast, cost effective solutions to these supply chain problems.

It truly will be a game changer when it comes to further assisting manufacturers find onshoring solutions. Senators, expanding MEP is a critical seed in the CHIPS and Science Act. As you well know, for every \$1 in Federal investment, MEP generates \$26 in new sales growth, and \$34 in new client investment.

MEP-led innovation in manufacturing related products and processes, coupled with training our workforce to support these new technologies, will only further evolve the small and mid-sized manufacturers here in the United States.

As expanded MEP—an expanded MEP system, thanks to the CHIPS Act, investment will be a foundation for America’s SMEs to build their own opportunity for exponential growth through local supply of material, new product and process technology, and a highly skilled workforce.

I leave you this afternoon with both my WMEP Board Chair and SME leader hats on and ask that you continue to support CHIPS and Science Act and the designated funding for the MEP Network. Thank you.

[The prepared statement of Mr. Zakreski follows:]

PREPARED STATEMENT OF C. TODD ZAKRESKI, PRESIDENT, HUSCO AUTOMOTIVE LLC AND BOARD CHAIR, WISCONSIN MANUFACTURING EXTENSION PARTNERSHIP (WMEP)

Good afternoon, Chair Baldwin, Ranking Member Sullivan, and distinguished Members of the Committee. Thank you for the opportunity to testify about the role of small and medium sized enterprises (SMEs) in advancing domestic manufacturing and the potential support that the Commerce Department can provide through its Manufacturing Extension Partnership (MEP). I am President of Husco Automotive, a medium sized, minority-owned Wisconsin based global manufacturer of highly engineered hydraulic and electromagnetic controls for current and new automotive propulsion systems. I am also the current Board Chair of the Wisconsin Manufacturing Extension Partnership, providing me the unique position of being both a MEP consumer and directly connected witness to the exceptional value and return on investment that the MEP system delivers to America’s SME’s.

My first experience with the WMEP was in my current role at Husco and prior to joining the WMEP board. Five years ago, Husco embarked on a venture to design and build our own advanced manufacturing equipment. As we developed into becoming our own integrator, we decided we also wanted to help small manufacturers in Wisconsin solve their manufacturing challenges. The WMEP provided multiple manufacturing-specific programs and venues for us to introduce our capabilities and competencies to just such a group. We connected with a small manufacturer in need of solving a complicated packaging problem that was difficult for the operator to execute by hand, making the 3-shift per day/5 days-a-week task frustrating and physically unpleasant. The issue was also creating internal capacity constraints causing lost sales and profits. Our Advanced Manufacturing Group established a unique solution that eliminated the need for the operator to execute this specific task. We built the machine, introduced it to their shop floor and successfully eliminated the problem. The small manufacturer, with the help of the WMEP, secured training for the operator such that he gained new skills associated with providing technical support and maintenance for this and several other production equipment machines on their factory floor. As simplistic of an example this specific engagement represents, it was a powerful statement across several areas pertaining to key elements of the MEP mission. Sometimes, it is the simplest success stories that carry the most insight into the best way forward. First, through their targeted technology and services programs and state-wide manufacturing events, they introduced a small manufacturer to local sources of relevant advanced manufacturing technology and integration. Second, they facilitated the development of a machine operator such that he could step into a more value-adding role for both the company and his overall personal situation. I share this story because it represents how two SME’s, one with an advanced manufacturing solutions capability connected and collaborated thru the MEP system in advancing the state of manufacturing for the common good and developing the workforce such that both the business and the worker realize a positive outcome.

To be globally competitive . . . no, strike that, to be the clear global leader of the most advanced technologies and manufacturing processes in the world, we must embrace and grow organizations like the MEP, who onboard some of the best talent across all aspects of manufacturing, leveraging their many years of expertise in their respective areas to help guide our SME’s, and ultimately all of America’s manufacturers, toward that goal. The MEP’s are perpetual drivers of innovation in product and process. And they have mastered how to couple that with helping to find the right paths of development for the workforce. The link between onboarding advanced technologies and processes and connecting SME’s with the right training for its workforce is an especially important attribute of the MEP expertise portfolio that I wanted to highlight here for you today.

Another area I would like to touch on is supply chain. Husco Automotive has experienced its share of challenges in securing material from overseas and has been working hard over the last 3 years to move parts to local sources. As Board Chair of the WMEP, I have had the opportunity to see several engagements that have solved supply chain problems. 'Help us find a source for this part in the United States as we can no longer afford supply chain delays from overseas sourcing due to volatility in freight schedules, international shipping costs, and political unrest' is a common ask of our consultants. The MEP system is the natural leader to help solve this problem. As more and more MEP engagements occur, America's SME's will become the best global solution for supply. In fact, it's happening already. At the WMEP, I have seen multiple SME manufacturers that we have engaged with grow their sales by 15 percent+ and becoming that onshore 'solution' thanks to process improvements and new investments in advanced manufacturing technology and workforce development—all guided by WMEP consultants. With more success stories like these which I have witnessed at the WMEP, we will be able to move even quicker in getting SME's to play a bigger role being that 'onshoring' solution.

An additional benefit from these types of MEP engagements that will also come out of the proposed CHIPS Act MEP investment will be a national database of suppliers that will be available for MEP's system-wide to access and use to help identify high potential, local source options facilitating fast, cost effective solutions to these supply chain problems. It truly will be a game changer when it comes to further assisting manufacturers find 'onshoring' solutions.

Senators, expanding the MEP is a critical 'seed' in the CHIPS and Science Act. As you well know, for every one dollar of Federal investment, MEP generates \$26 in new sales growth and \$34 in new client investment. MEP-led innovation in manufacturing related product and process coupled with training our workforce to support these new technologies will only further evolve the small and mid-size manufacturers here in the United States. An expanded MEP system, thanks to the CHIPS Act investment, will be the foundation for America's SME's to build their own opportunity for exponential growth through local supply of material, new product and process technology, and a highly skilled workforce. I leave you this afternoon with both my WMEP Board Chair and SME leader hats on and ask that you support the CHIPS and Science Act and the designated funding for the MEP network.

Thank you for your time and consideration.

Senator BALDWIN. Thank you, Mr. Zakreski. I just want to explain, you will see a little shuffling around. We have just had a vote called on the Senate floor, and so we are going to take turns.

Ranking Member Sullivan is going to go cast his vote, return, and then I will put the Committee into his control while I do the same. And I am expecting other members to come in and out during that.

So, apologies to our witnesses for the disruptions, but let's carry on with Dr. Shivakumar.

**STATEMENT OF SUJAI SHIVAKUMAR, PH.D., DIRECTOR  
AND SENIOR FELLOW, RENEWING AMERICAN  
INNOVATION PROJECT, CENTER FOR STRATEGIC  
AND INTERNATIONAL STUDIES**

Dr. SHIVAKUMAR. Chair Baldwin, and Ranking Member Sullivan, and others who may come in and out, my name is Sujai Shivakumar. I am a Senior Fellow at the Center for Strategic and International Studies.

As a bipartisan, nonprofit policy research organization dedicated to advancing practical ideas to address the world's challenges, CSIS's purpose is to define the future of national security. Accordingly, CSIS has launched a major program called Renewing American Innovation, which I lead.

RAI's purpose is to strengthen the policy foundations that have created the most dynamic and successful innovation system in his-

tory, and which is the foundation of our national security today and in the future.

So thank you so much for this opportunity to testify today about the importance of manufacturing and innovation to our national security. Innovation, in fact, has long been cited as a critical to addressing the Nation's challenges in economic growth and national security, and improving the health and well-being of Americans.

It is also important to recognize that our innovation system itself is a national security asset, one that underpins our continued prosperity and competitiveness, and military strength. This asset has to be rejuvenated as new global realities and opportunities arise.

As we know, other countries in recent decades have invested in building their innovation systems, recognizing it to be an engine for their own rapid economic development and national strength. They now have the means and often the will to capitalize on the investments that we make in R&D.

China, for example, is investing heavily in building up its workforce and manufacturing infrastructure, enabling that nation to capitalize on the new ideas generated by our world class research system. This strategy allows them to develop advanced weapons and create competitive products for the global markets more rapidly. We then need a new strategy for this technologically multipolar world.

A strategy informed by a better understanding of the innovation process. So this term, innovation ecosystem, is used frequently, but it requires—but what it does, it describes a rich networks of cooperation among scientists and researchers, entrepreneurs and investors, small and large manufacturers, high skill and technically skilled workers, as well as local, State, and Federal agencies.

This process, when it works well, is both bottom up and top down. It is actually federalism in action, and it is arguably the secret sauce behind American technological leadership. But this system does not work—does not exist in a vacuum.

It relies on all of these actors overcoming a variety of barriers to cooperation. They need to speak the same technical language. They must be able to share their ideas securely and easily. They need to convince investors of the values of their ideas, and they need to find able partners and collaborators to scale up and manufacture products, creating jobs and creating regional growth.

Fortunately, the solutions to many of these problems exist, and Congress needs to upgrade and reinvest in these solutions, while engineering new ones that strengthen our national innovation system. So what can Congress do to strengthen the American innovation system?

Permit me to briefly outline six priorities for America's small and medium manufacturers. First, Congress should reinforce U.S. standards leadership. Leadership in setting standards has long allowed the United States to set the terms of the global technology conversation, but this leadership is under threat.

China's leaders recognize that the commercial and national security advantages of standards leadership, especially in emerging communications technologies. They have embarked on a China Standards 2035 strategy plan and are actively participating in global standards setting organizations.

The role of NIST in working with the private sector to develop global technological standards needs to be reinforced by vigorous American re-engagement in organizations such as the ITU. Second, Congress should secure the patent system. Strong intellectual property rights ensure that individuals can benefit from their ingenuity and hard work, creating an opportunity to monetize new ideas.

Third, Congress should encourage entrepreneurship. Americans celebrate entrepreneurship, but entrepreneurial small businesses often find it challenging to demonstrate their ideas, commercial potential to investors.

Federal programs like the Small Business Innovation Research Program can help bridge this gap through merit based awards. SBIR alerts potential investors to technologies with commercial viability, improving the functioning of private capital markets.

Congress can help the SBIR by stabilizing this program and making it more predictable. Fourth, Congress should continue to focus on U.S.-based manufacturing. National and regional investments in manufacturing undertaken by our foreign competitors are significantly larger than comparable U.S. investments and are more weighted toward later stage applied research and product development.

In response, the United States has sought to build the Manufacturing USA institutes, which are loosely modeled on a German Fraunhofer system and are designed to support translational innovation by companies, particularly by small firms.

But while the program has significant potential to strengthen our innovation efforts, these institutes are underfunded. With just some 14 institutes, Manufacturing USA is a relatively lean program compared to the 70 plus Fraunhofers, and China also has borrowed the manufacturing center concept and has apparently expanded significantly.

Fifth, Congress should connect regional resources. The innovation system as a network of networks can be strengthened by building connections across existing research, financing, and manufacturing assets, and the NIST MEP program is an indispensable asset in this regard. The CHIPS and Science Act expands MEP to help these manufacturers improve cybersecurity, worker training, and supply chain resiliency.

As we have heard, this support of course is welcomed, but it needs to be followed up by sustained and substantial funding from Congress. It is a long term effort. Finally, Congress should build and broaden a skilled technical workforce.

Renewing our innovation system requires overcoming decades of underinvestment in our own citizens. Congress can support and enhance strategies ensuring that all stakeholders, including students, workers, employees, educational institutions, have the right information, tools, and incentives to improve access to quality, technical education and training.

In that regard, as an example, the Department of Labor has supported innovative efforts to strengthen the talent pipeline in the semiconductor industry through the efforts of the National Institute for Information Technology, an institution designed to support regional talent development on a virtual platform that can generate scalable and stackable credentials for the rapidly growing

needs of the semiconductor industry, and that the model can also be transferred to other industries as well.

So overall, our Nation's innovation system, which as I mentioned, is the foundation of our economic competitiveness and national security, is continually strengthened by encouraging new ideas, nurturing entrepreneurship, and fostering cooperative connections.

As I have outlined, there is no silver bullet, we need to do all of the above, but on a sustained basis and at scale. In times past, Congress has repeatedly stepped up to renew and strengthen our innovation system, and this is a critical opportunity to do this again. Thank you for your attention.

[The prepared statement of Dr. Shivakumar follows:]

PREPARED STATEMENT OF SUJAI SHIVAKUMAR, PH.D., DIRECTOR AND SENIOR FELLOW, RENEWING AMERICAN INNOVATION PROJECT, CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES

#### **Securing the U.S. Innovation System**

Chair Baldwin, Ranking Member Sullivan and Members of the Subcommittee, my name is Sujai Shivakumar, Senior Fellow at CSIS, where I direct the project on Renewing American Innovation. As a bipartisan, nonprofit policy research organization dedicated to advancing practical ideas to address the world's challenges, CSIS's purpose is to define the future of national security. Accordingly, CSIS has launched a major program called Renewing American innovation, which I lead. RAI's purpose is to strengthen the policy foundations that have created the most dynamic and successful innovation system in history to strengthen our national security today and in the future.

Thank you for the opportunity to testify today about the importance of manufacturing and innovation for our national security.

#### **Innovation as a National Security Asset**

Innovation has long been critical to addressing the nation's challenges in economic growth and security, and to improving the health and wellbeing of Americans. Indeed, it is important to recognize that our innovation system is itself a national security asset—one that underpins our continued prosperity, competitiveness, and military strength. This asset has to be rejuvenated as new global realities and opportunities arise.

Much of today's industrial strategy was designed in the 1950s to meet our needs during the Cold War. At that time, Congress invested in the nation's continued technological leadership by creating new institutions such as the National Science Foundation, expanding the National Institutes of Health, and by developing new infrastructure for research and development through the organization of National Laboratories and increased funding for research universities.

Federal policy in the postwar period focused on funding research and development at the front end while enabling the commercialization and procurement of new technologies at the back end, allowing new products to reach the market. Early procurement of semiconductors through the Minuteman and Apollo spaceflight programs allowed us to take an early and strong technological lead, becoming a key element of our economic and military superiority over the Soviet Union.

#### **An Innovation Ecosystem for a Multipolar World**

Today we can no longer rely on this strategy alone because other countries in recent decades have invested in building their innovation systems, recognizing it as an engine for their own rapid economic development and national strength. They now have the means and often the will to capitalize on the investments we make in R&D. China, for example, invests heavily in building up its workforce and manufacturing infrastructure, enabling that nation to capitalize on the new ideas generated by our world class research system. This strategy allows them to develop advanced weapons and create competitive products for global markets.

We need a new strategy for a technologically multipolar world, a strategy informed by a better understanding of the innovation process. The term "innovation ecosystem" is now widely used to describe rich networks of cooperation among scientists and researchers, entrepreneurs and investors, small and large manufacturers, high-skilled and technically skilled workers, as well as local, state, and federal agencies. This process, when it works well, is both bottom-up and top-down—it is

federalism in action, and it is arguably the secret sauce of American technological leadership.

But this system does not exist in a vacuum. The innovation system relies on all these actors overcoming a variety of barriers to cooperation—they need to speak the same technical language, they must be able to share ideas securely and easily, they need to convince investors of the value of their ideas, and they need to find able partners and collaborators to scale-up and manufacture products, creating jobs and regional economic growth. Fortunately, solutions to many of these problems exist and Congress needs to upgrade and reinvest in these solutions while engineering new ones to strengthen our national innovation system.

### **Strengthening the Innovation System**

What can Congress do to strengthen the American Innovation System?

- *Congress should Reinforce U.S. Standards Leadership:* Technical standards provide the shared vocabulary and grammar that allows researchers, manufacturers, and consumers to speak the same language across the innovation ecosystem. Leadership in setting standards has long allowed the U.S. to set the terms of the technology conversation, but this leadership is under threat. China's leaders recognize the commercial and national security advantages of standards leadership, especially in emerging communications technologies. They have embarked on a China Standards 2035 strategy and are actively participating in global standards-setting organizations. The role of the National Institute for Standards and Technology in working with the private sector to develop global technological standards needs to be reinforced by vigorous American reengagement in organizations such as the International Telecommunications Union. We need to recognize that organizations that were previously not the focus of U.S. policy makers' attention now need to be—they are certainly high on China's policy agenda.
- *Congress should Secure the Patent System:* Strong intellectual property rights ensure that innovators can benefit from their ingenuity and hard work, creating an opportunity to monetize new ideas. However, in the American system, patents are important not only as incentives to invent, but as incentives to share ideas. The ability to protect an idea provides the security inventors need to bring their innovations into the public forum and forge commercial collaborations with other innovators through licensing agreements. The U.S. needs to maintain the role that its patent system has played in spurring innovation against those who would benefit from weaker enforcement, including defending it vigorously against poaching of intellectual property belonging to small businesses by large businesses, and by brazen theft through cyber intrusions by China and other rivals. In addition to maintaining our patent system so that it continues to protect our innovative small and medium enterprises we need to include courses in cyber defense as a routine part of our science, engineering, and business education curriculum. Congress can further support this by beefing up our national cyber defense infrastructure.
- *Congress should Encourage Entrepreneurship:* Americans celebrate entrepreneurship and recognize that failure is often a step on the path to commercial success. But entrepreneurs often find it challenging to demonstrate their idea's technological potential to investors. Many promising technologies are lost to the so-called "Valley of Death" between early-stage research and commercial adoption due to lack of sustained investment. Federal programs like the Small Business Innovation Research Program (SBIR) help bridge this gap through merit-based awards. A key finding of a major National Academy of Sciences study<sup>1</sup> is that SBIR alerts potential investors of technologies with commercial viability, improving the functioning of private capital markets. Congress needs to institutionalize this exceptionally effective program, one that is widely emulated abroad as a best practice in innovation policy.<sup>2</sup>
- *Congress should Continue to Focus on US based Manufacturing:* Seeking to capture the global market opportunity in emerging technologies, major U.S. competitors in Europe and East Asia have launched targeted, large-scale programs, with significant government funding to develop these new technologies, refine them, and ultimately manufacture them within their national borders. National and regional investment undertaken by our foreign competitors are significantly

<sup>1</sup>National Research Council. *An Assessment of the SBIR Program*. Washington, DC: The National Academies Press, 2008. <https://doi.org/10.17226/11989>.

<sup>2</sup>Jonathan M. Barnett. *Innovators, Firms, and Markets: The Organizational Logic of Intellectual Property*. Oxford University Press, 2021.

larger than comparable U.S. investment and are more weighted toward later-stage applied research and product development. In response, the United States has sought to build a nationwide network of cooperative research Centers, known as the Manufacturing USA institutes, which are loosely modeled on the German Fraunhofer system and are designed to support translational innovation by companies—particularly small firms. While the program has significant potential to strengthen innovation networks, these programs are underfunded. With just 14 institutes, Manufacturing USA is a relatively lean program compared to the 70+ Fraunhofers. China, by contrast, has borrowed the Manufacturing Center concept and apparently has expanded it significantly.<sup>3</sup>

- *Congress should Connect Regional Resources:* The innovation system, as a network of networks, can be strengthened by building connections across existing research, financing, and manufacturing assets at the state and regional level. The NIST Manufacturing Extension Partnership (MEP) helps small- and medium-sized manufacturers make these connections so that they have the resources needed to improve efficiency, reduce costs, create new products, and find new markets.<sup>4</sup> The *CHIPS and Science Act* expands MEP to extend its work with small- and medium-sized manufacturers to improve cybersecurity, worker training, and supply chain resiliency. This support is welcome and needs to be followed up with sustained and substantial funding from Congress. Above all, it has to be a long-term effort.
- *Congress should Build and Broaden a Skilled Technical Workforce:* Renewing America’s innovation system requires overcoming decades of underinvestment in the American workforce. Federal efforts must encourage training programs anchored on industry-relevant skills and must promote hands-on experience through industry internships and in community colleges through public-private partnerships. In response to globalization and advances in science and technology, American firms are demanding workers with strong interpersonal, technical, and problem-solving skills. Employers also increasingly cite the presence of a skilled workforce as a key factor in decisions to re-shore production.<sup>5</sup> Congress can support and enhance strategies ensuring that all stakeholders, including students, workers, employers, and educational institutions, have the right incentives to improve the quality of technical education and training, and develop new models of governance to encourage fruitful experimentation and collaboration. Universities, like other institutions, need to adapt to new challenges—and they need the right incentives to do so.

#### A New Agenda

Our nation’s innovation system—which is the foundation of our economic competitiveness and national security—is continually strengthened by encouraging new ideas, nurturing entrepreneurship, and fostering cooperative connections. As I have outlined, there is no silver bullet. We need to do all of this on a sustained basis. In times past, Congress has repeatedly stepped up to renew and strengthen this critical national asset. That opportunity is at its door again.

Senator BALDWIN. Yes. Thank you, Dr. Shivakumar. And we are—last but not least, Mr. Vasko, welcome.

#### STATEMENT OF DAVID VASKO, SENIOR DIRECTOR, ADVANCED TECHNOLOGY, ROCKWELL AUTOMATION

Mr. VASKO. Thank you, Chair Baldwin, and Ranking Member Sullivan, and distinguished panel. My name is David Vasko. I am Senior Director of Advanced Technology at Rockwell Automation. I have worked in this field for 38 years.

<sup>3</sup>National Academies of Sciences, Engineering, and Medicine. *Securing Advanced Manufacturing in the United States: The Role of Manufacturing USA: Proceedings of a Workshop*. Washington, DC: The National Academies Press, 2017. <https://doi.org/10.17226/24875>.

<sup>4</sup>National Research Council. *21st Century Manufacturing: The Role of the Manufacturing Extension Partnership Program*. Washington, DC: The National Academies Press, 2013. <https://doi.org/10.17226/18448>.

<sup>5</sup>National Research Council. *Rising to the Challenge: U.S. Innovation Policy for the Global Economy*. Washington, DC: The National Academies Press, 2012. <https://doi.org/10.17226/13386>.

Rockwell was founded as Allan Bradley in 1903, and they are a global leader of industrial automation and digital transformation. We are headquartered in Milwaukee, Wisconsin. We employ nearly 26,000 employees, serving customers throughout 100 countries. It would be difficult to walk into a factory today and not see any of our products being used.

We like to say by the time you get to work, you probably have used four or five products we have helped to create, from coffee to breakfast to transportation to energy or fuel. So why is a large company like Rockwell Automation here to talk to you about small manufacturing?

Rockwell partners with small and medium enterprises, SMEs, every day to provide automation products and solutions, enabling them to be globally competitive. SMEs are vital part of our and our Nation's integrated supply chain.

U.S. manufacturers are being challenged with global supply chain disruptions and greater demands for mass customization, driving reshoring of manufacturing, both a great opportunity and a challenge for SMEs.

The CHIPS and Science Act supports this reshoring trend by strengthening domestic chip manufacturing and creating a stronger manufacturing ecosystem. We recommend focusing on four critical areas to achieve this vision.

First, we need to build the workforce to succeed. The MEPs can help to inform young Americans that manufacturing jobs are attractive, high tech, clean, safe, and offer family sustaining wages to help increase the number of workers seeking careers in manufacturing.

The National Association of Manufacturers estimates approximately 800,000 unfilled manufacturing positions today, and this is projected to increase to 2.1 million by 2030. These are solid, high paying careers.

Second, promote the upskilling of our current workers, as well as new employees entering the workforce, ensuring they have the skills they need for tomorrow's manufacturing. Upskilling not only increases the workers' salaries, but provides them with versatile skills to ensure rewarding, lifelong careers.

Third, MEP and Manufacturing USA should increase the productivity of workers by adoption of advanced automation tools and solutions. These are the automation tools and solutions we see developed every day in the 16 Manufacturing USA institutes.

The U.S. has a remarkable workforce, equipping them with the best automation tools, including advanced tools like artificial intelligence, augmented reality, robotics, and cloud based analytics will ensure they will be successful. And fourth, we need to ensure SMEs remain an integral part of the modern, interconnected supply chain.

We are seeing gaps emerged manufacturing between the best and the rest. Leading manufacturers are deploying advanced automation technologies and cybersecurity hardening to drive unprecedented productivity, resiliency, flexibility required in today's global markets. But many manufacturers struggle with adopting these practices, and this is especially true for the SMEs.

The MEP and tech hubs are vital to achieving this goal. Rockwell has been a member of four of the Manufacturing USA institutes. Each institute focuses on critical technical areas in specific to different areas of being in factoring. These projects are generally conducted with suppliers, academics, and manufacturers to demonstrate real life applications of these technologies and to facilitate adoption.

Let me give you one example of a project we worked on in Manufacturing USA's advanced regenerative manufacturing institute, ARMI/BioFab. In a laboratory environment, research scientists were able to generate a person's own cells, tissues, and parts of some organs, a medical miracle that virtually eliminates the possibility of rejection and the need for immune suppression in patients.

But it is a large step from a lab experiment to producing these regenerative solutions, to the quality, quantity, cost, and location where they are used and where they are needed. And that is where Manufacturing USA comes in. We worked with the scientists there to develop a scalable, modular, closed loop system, which isn't much larger than this desktop we are behind today, that allows cells and tissues to be produced at volume with controlled quality.

Rockwell applauds the spotlight the CHIPS and Science Act has put on American manufacturing. Federal investment supporting American entries will revitalize our world class manufacturing ecosystem, support our workers, and ensure future supply chain resiliency.

Rockwell appreciates the Subcommittee's continued leadership and support and welcome the opportunity to testify at this hearing. We look forward to continued collaboration with you and your staff to ensure America can maintain and enhance our leadership in advanced manufacturing for years to come.

Thank you.

[The prepared statement of Mr. Vasko follows:]

PREPARED STATEMENT OF DAVID VASKO, SENIOR DIRECTOR, ADVANCED TECHNOLOGY,  
ROCKWELL AUTOMATION

Good afternoon, Chair Baldwin and Ranking Member Sullivan, and distinguished Members of the subcommittee. Thank you for this opportunity to speak with you today about the value and continued importance of our Nation's manufacturing, supply chain and workforce development.

My name is David Vasko. I am the Senior Director of Advanced Technology for Rockwell Automation, responsible for applied research and development and global product standards and regulations. I have been working in this field for 38 years and am honored to serve on the Department of Commerce's National Institute of Science and Technology (NIST) Visiting Committee on Advanced Technology.

Founded in 1903 as Allen Bradley, Rockwell Automation—"Rockwell"—is a global leader in industrial automation and digital transformation. We connect the imaginations of people with the potential of technology to expand what is humanly possible, making the world more productive and more sustainable. Headquartered in Milwaukee, Wisconsin, Rockwell employs nearly 26,000 problem solvers dedicated to our customers in more than 100 countries.

Rockwell's automation tools help our customers produce key products and solutions Americans need and use every day, including electric vehicle and automotive parts and components, pharmaceuticals and vaccines, food and beverages, medical devices, chemicals, printing, paper and publishing materials, products and components for the defense industry, semiconductors, and extractable minerals, oil, and gas. Additionally, Rockwell's products and systems operate critical infrastructure such as power generation and water treatment facilities. Our products permeate across our Nation's manufacturing ecosystem. In fact, it would be difficult to walk

into a factory in the U.S. and not see our hardware and software helping manufacturers to become more competitive, agile, and sustainable.

Rockwell partners with small- and medium-sized enterprises (SMEs) every day to provide automation products and solutions enabling them to be globally competitive and deliver high quality products and services. SMEs are a vital part of our Nation's integrated supply chain.

U.S. manufacturers are facing a new era of uncertainty and change because of global supply chain disruptions, and greater demands for mass customization. These upheavals have spurred new opportunities, driving reshoring and localization of manufacturing—both a great opportunity and a challenge for SMEs.

The CHIPS and Science Act aims to support this reshoring trend by strengthening domestic chip manufacturing and creating a stronger manufacturing ecosystem—from a more robust supply chain to a greater skilled manufacturing talent pool.

To ensure a stronger domestic ecosystem for generations to come, the Commerce Department, through its Manufacturing Extension Partnership (MEP), Manufacturing USA (MUSA) initiative, should focus on four areas:

1. Attracting more workers to seek careers in manufacturing.
2. Improving the skills of people in manufacturing today to prepare them for the future.
3. Adoption of advanced automation tools and solutions to improve productivity.
4. Supporting further integration of SMEs into our modern connected supply chains.

First, the CHIPS legislation, although a great step towards codifying industrial policy, will fall short of its ambition unless we build and cultivate the workforce necessary to succeed. The largest generation in U.S. history, baby boomers, is aging out of the workforce, hitting the manufacturing sector particularly hard. The shortage of manufacturing workers is not only demographic but cultural as well. The new MEP authorities must show, and convince, young Americans that manufacturing jobs are high-tech, clean, safe, and offer family-sustaining wages, to help increase the number of workers seeking careers in manufacturing. The National Association of Manufacturers estimates that the approximately 800,000 unfilled manufacturing positions could increase to nearly 2.1 million by 2030. These are solid, high-paying careers, but there is a perception that manufacturing, and factory jobs are low-skilled, low-paying, menial, and hazardous. That couldn't be further from the truth in today's high-tech manufacturing.

Second, the Department of Commerce should implement new regulations promoting the upskilling of our current workers as well as upskilling new employees entering the workforce. This means leveling up our manufacturing workers and ensuring they have the skills they need for tomorrow's manufacturing. Upskilling means adopting a model of life-long learning to meet the needs of employers as well as take advantage of the latest technology. Upskilling not only increases worker salaries, but it also arms them with versatile skills that will ensure future job security as consumer demands change, and create rewarding, lifelong careers.

To tackle the critical skills shortage in the fast-evolving manufacturing sector, in 2017 Rockwell and ManpowerGroup developed the *Academy of Advanced Manufacturing (AAM)*—a joint initiative to provide U.S. military veterans with the upskilling they need to succeed in advanced manufacturing roles. The 12-week training program combines instructor-led classroom learning with hands-on technical laboratory experience. More than 300 veterans have gone through the training and become certified, resulting in more than 85 percent of graduates securing a job paying on average between \$60,000–\$75,000 annually after completing the program. Programs such as this could be replicated and scaled in high-need areas to address the skills gap.

Third, MEP and MUSA should increase the productivity of each worker by adoption of advanced automation tools and solutions. These are the automation tools and solutions we see developed every day in the 16 Manufacturing USA institutes. The U.S. has a remarkable workforce and equipping them with advanced automation tools—like artificial intelligence or machine learning, augmented reality, robots, and cloud-based software—will give these workers the superpowers needed to remain globally competitive and will continue to increase employment.

Fourth, we need to ensure that SMEs remain an integral factor in today's modern and inter-connected supply chains. We are seeing gaps emerge in manufacturing between the best manufacturers and the rest. Leading manufacturers are deploying advanced technologies such as Augmented Reality/Virtual Reality, Artificial Intelligence/Machine Learning, Digital Twins, cloud, additive manufacturing, wireless networking, and advanced robotics to drive unprecedented productivity, resiliency

and flexibility required to be competitive in today's global markets, and then securing it with robust implementation of cybersecurity strategies. But most manufacturers are unable to do these things at this time—especially SMEs. Cloud solutions are particularly important because they democratize automation and reduce large capital investments which can be a barrier to SME adoption.

We need to ensure all U.S. manufacturers can adopt these solutions so they can keep pace with the larger players in the industry. The MEP program and technology and innovation hubs can be that bridge and can help enable SMEs to adopt advanced manufacturing solutions.

Beyond revitalizing the manufacturing of today, the MUSA program is critical to accelerating the manufacturing growth needed for tomorrow's innovations. Rockwell has been a member of four out of the 16 American manufacturing institutes, including CESMII, MxD, REMADE, ARMI/BioFabUSA, and collaborated with NIIMBL. Each institute focuses on critical technical gaps in specific areas of manufacturing with the goal of resolving these critical gaps and delivering these solutions to U.S. manufacturers. Typically, these projects are jointly conducted with suppliers, academics, and manufacturers to demonstrate the real-life applications of these technologies. It goes beyond writing an article, and applies the technology on a manufacturing line, factoring in all the required real-world constraints.

Manufacturing USA provides solutions to these deep technical gaps, needed to develop cutting-edge technologies and innovations, and we must continue to fund these and new institutes to tackle America's emerging needs.

Let me give you an example of a project we worked on at the Manufacturing USA ARMI/BioFabUSA Institute where research scientists were able to demonstrate remarkable regenerative medical solutions. In a laboratory environment, they were able to regenerate a person's own cells, tissues and parts of some organs, a medical miracle that eliminated the possibility for rejection and the need for immune suppression medication in patients. But it is a large step from a lab experiment to producing these regenerative medical solutions at the quantity, quality, cost, and location where they are needed. That is where Rockwell comes in—we worked with the research scientists at ARMI/BioFabUSA to develop a scalable, modular, closed loop system that isn't much larger than a desktop. This type of manufacturing suite is quite typical in manufacturing processes but revolutionary in regenerative medicine. It allows cells and tissues to be produced at volume and with controlled quality.

Rockwell applauds the spotlight the CHIPS and Science Act has put on American manufacturing industry. After decades of offshoring jobs and overreliance on foreign supply chains, Federal investments supporting American industries will revitalize our truly world class manufacturing ecosystem; support our workers; and ensure future supply chain resiliency through local sourcing. But beyond legislation adoption, we must ensure proper implementation, cultivate a reliable skilled workforce here at home, and expand the MEP's role through the creation of regional tech hubs so SMEs can keep up with the latest innovations and ensure the success of manufacturing in the U.S. for current and future generations.

Rockwell appreciates the Subcommittee's continued leadership and support, and we welcome the opportunity to testify at this critical hearing. We look forward to continued collaboration with you and your staffs to ensure that America can maintain and enhance our global leadership in advanced manufacturing for years to come.

#### Acronyms

AAM	Academy of Advanced Manufacturing
ARMI/BioFabUSA	Advanced Regenerative Manufacturing Institute
CESMII	Clean Energy Smart Manufacturing Innovation Institute
CHIPS	Creating Helpful Incentives to Produce Semiconductors
MEP	Manufacturing Extension Partnership
MUSA	Manufacturing USA
MxD	Manufacturing times Digital
NIIMBL	National Institute for Innovation in Manufacturing Biopharmaceuticals
NIST	National Institute of Science and Technology
REMADE	Reducing EMBodied-energy And Decreasing Emissions
SME	Small and Medium-sized Enterprise

Senator BALDWIN. Thank you for your testimony. Thank you all for your testimony. We are now going to begin a round of 5 minute questions from members of our subcommittee. I will note, since it perhaps wasn't made clear prior, that we do have several people who are joining remotely.

We have implemented that since the beginning of the pandemic. And so you may, as the afternoon moves on, have some of those questions come. You will be able to see and hear the individuals when that happens. I want to start with myself, and with Mr. Zakreski. Thank you again for making the trip to Washington, D.C.

It is great to have you here. You mentioned in your testimony that MEP has helped Wisconsin manufacturers increase their capacity so that they can become a supplier for domestic manufacturers who may have big orders to fill.

We often think of reshoring as bringing back capacity that was totally gone. But it sounds like in some cases this reshoring or supply chain shortening is a matter of getting small manufacturers to grow so that they can work with bigger partners.

Can you elaborate a bit on that dynamic and explain how MEP has been able to help in that upshoring?

Mr. ZAKRESKI. Absolutely. Chair Baldwin, thank you for the question. The small manufacturers have really embraced some of the activities that the MEP system is deploying through improving efficiencies within the small manufacturer, through providing solutions, to enhancing capacity.

The WMEP, for example, has a large group of consultants with an extensive list of expertise and strengths. And what they do is, they go into the small manufacturer, they assess their situation, they assess the challenges that they have, whether it be capacity, whether it be cost, whether it be an awareness issue of just getting their name out so that larger OEMs can actually understand that they are a solution for them, and the MEP steps in and provides that guidance.

They provide the tools, they provide them with the introductions to the organizations that they need to enhance their operations. And by doing that, it really creates a much more competitive situation for that small manufacturer, such that the larger manufacturers now, it makes sense for them.

Not only does it offset the logistics problems, as it offset the political unrest challenges that they have had, but probably the big piece of that is that it creates a more cost competitive solution that makes them competitive against the overseas option.

Senator BALDWIN. Right. Thank you. Dr. Lee, you noted in your testimony that we invent things here, but those inventions often are manufactured elsewhere.

In my opening remarks, I mentioned my Invent Here, Make Here legislation which was inspired by stories of federally funded breakthroughs being licensed to Chinese manufacturers due to a lack of interest by investors in the United States.

In your experience, what are some of the concerns that manufacturers and their investors have on their minds when considering licensing Federal innovations? And how can Government address some of those concerns in order to encourage more domestic production of these cutting edge inventions—sorry, innovations?

Dr. LEE. Thank you very much for that question. I think there is an aspect of Government marching rights as it applies under the current Bayh-Dole Act, but I actually don't think that is a driver.

So I want to mention it, but I don't think that is the driver. I think the bigger way to think about this is as technologies are in-

vented, they have to mature in order to ultimately be valuable to society and therefore valuable to companies.

And as things are invented, they are still at a pretty early stage in many cases. And so as investors or as big companies look at the portfolio of technology options, they may not have the risk tolerance to take something that is relatively early stage and mature it themselves to realize that benefit later.

And if you look at other countries or you look at other ecosystems around the world, they may have a different risk tolerance profile which might make them attracted. I think that is exactly to the heart of what Manufacturing USA institutes are supposed to do, to take those early stage proof of concept inventions, mature them here, make them available here, ensure there is a workforce here to understand how to use and deploy those technologies, and help create that environment that we all seek to support our economic security.

Senator BALDWIN. Thank you. Thank you very much. Next in order is Senator Sullivan. I am going to be departing to try to cast my vote. The order after that, if full committee Chair Cantwell arrives, we are going to turn to her for opening statements and questions.

If she does not, Senator Peters has been on remotely since the beginning of the meeting, and he would be called on next. All right, Senator Sullivan.

Senator SULLIVAN. Thank you, Madam Chair. Well, let me—I am going to start with just a general question, and it relates to manufacturing and input of manufacturing, and I would like all of you to just touch on it.

My state, we are trying to be a much bigger manufacturing state, but we are a huge energy state. And having low cost, reliable American energy, whether it is renewables or oil or natural gas, I think, provides comparative advantages to us in a whole host of areas. We also do it with the highest environmental standards of any place in the world.

Can you guys—can I get all the witnesses to just briefly, but just talk about from your perspective in the areas that you are focused on, what it means to have reliable, domestic supplies of American energy for manufacturing and how important that is.

And maybe we will just start along the line here with you, Ms. Hines to begin with.

Ms. HINES. Thanks, Senator. It is a great question. It is critically important that we do our best to create low cost, reliable energy for manufacturers. As we have seen things being disrupted internationally, we have got to have that option for our manufacturers—

Senator SULLIVAN. And if it is domestic produced, all the better?

Ms. HINES. All the better, of course. Definitely—

Senator SULLIVAN. Well, you wouldn't—I mean, I agree, of course. But trust me—

Ms. HINES.—needs to be said.

Senator SULLIVAN.—there are certain people. We are—the Biden Administration just lifted sanctions on Venezuela to import more oil from Venezuela. And we have a very big project in Alaska called the Willow Project that they are still looking to shut down. So it

is, of course, to most people, but not everybody, unfortunately, so I appreciate your directness and honesty on that.

Ms. HINES. Sure. Obviously, the energy sector with a lot of investments in the energy sector, there is a lot of reason for manufacturers to really increase their workforce skills in that area, technologies in that area.

So not only creating it here but learning how to use it effectively and efficiently in their manufacturing facilities. So there is a big opportunity there for manufacturers to, again, look how that technology can influence their manufacturing processes and also make sure that we are upskilling the current workforce to be able to adapt to those new energies.

So that is critically important to manufacturers across the country that we have those.

Senator SULLIVAN. And energy is kind of manufacturing too, right, with all the inputs and—

Ms. HINES. Yes, absolutely.

Senator SULLIVAN. Great. Dr. Lee, do you have a view on that?

Dr. LEE. Yes, thank you. I will look at it from the lens of sort of the biopharmaceutical manufacturing industry.

Senator SULLIVAN. Yes, right.

Dr. LEE. Which is to start by saying, I think we want to be able to control our energy future.

Senator SULLIVAN. Yes.

Dr. LEE. To the extent to which we can control that, then we can have that stability and that reliability through whatever—

Senator SULLIVAN. And again, mostly domestically—to the extent we can—

Dr. LEE. Absolutely. Absolutely. And so the reason I raise that is, when it comes to manufacturing of biopharmaceuticals, it is actually an industry that is pretty risk averse. When it thinks about where am I going to put my next factory?

Senator SULLIVAN. Yes—

Dr. LEE. Of course there are a variety of considerations related to where is the R&D done, where is the workforce done.

There might be tax and other financial incentives to consider, but certainly the stability of the environment, the stability of energy, the stability of the workforce, the stability of policies, that all drives a lot of that decisionmaking. So I think it is critical.

Senator SULLIVAN. Yes. Mr. Zakreski, what about you and HUSCO?

Mr. ZAKRESKI. Thank you, Senator Sullivan. I think my comment will be more along the lines of that I think domestic energy means more jobs here in the U.S., whether that is Alaska, whether that is North Dakota—

Senator SULLIVAN. Right.

Mr. ZAKRESKI. But for me, as a leader of a U.S. based company who is also trying to localize a lot of material from overseas back to the U.S., that equates to jobs.

And that means that there are more jobs for our suppliers, there are more opportunities for suppliers. And I have to believe that the more domestic energy that we can generate and consume, whether it is renewable, whether it is gas—

Senator SULLIVAN. Yes, all the above, right. We have it in abundance for the whole country. I don't discriminate. You have got American energy and it is helping American workers and American industry, let's do it. Good. Great.

Mr. ZAKRESKI. Yes.

Senator SULLIVAN. Dr. Shivakumar, do you have a view on that, sir?

Dr. SHIVAKUMAR. Well, I think that Senator, as you pointed out, energy is manufacturing. And I think almost everything that this panel has said about the importance of having a secure manufacturing ecosystem, to make sure that we have reliable and adequate energy for our industry is essential.

I think it not only is integral to our other industries, but it also supports our domestic innovation ecosystem, which as I mentioned in my earlier remarks, is critical for our national security.

Senator SULLIVAN. Let me just real quick to follow up with you before I get to Mr. Vasko, you are an expert on our relationship with China and competing with China.

One thing I know, because I read the reporting and everything, the Chinese Communist Party leadership is very afraid of America's energy dominance. It is an area where we have giant strategic advantages internationally, and they don't have them. They are very reliant, as a matter of fact, on those kind of supplies.

Have you seen that in your studies at all, just what they worry about in terms of energy, because it is a big comparative advantage we have relative to China?

Dr. SHIVAKUMAR. I agree with you. Our ability to be self-sufficient in energy is a major strategic advantage for us.

Senator SULLIVAN. Yes. Great. Dr. Vasko—or Mr. Vasko, do you have any views on this in your business and some of the work you have done?

Mr. VASKO. Sure. Absolutely, Senator Sullivan. All of the manufacturing that is done requires energy. And we have seen that within the supply chain disruptions we have had. The better you control those, the better off you are.

So having a local source of energy, having control of that, having low cost energy helps America's manufacturers become more competitive. There is no doubt about that.

Senator SULLIVAN. And resist supply shocks, too, like we saw in the 70s.

Mr. VASKO. Absolutely. Absolutely.

Senator SULLIVAN. Good. See, we have unanimity on a big topic, so that is very good. OK, I am going to turn it over. Is Senator Peters on still or—? Senator Blumenthal. OK.

**STATEMENT OF HON. RICHARD BLUMENTHAL,  
U.S. SENATOR FROM CONNECTICUT**

Senator BLUMENTHAL. Senator Peters is not on.

Senator SULLIVAN. OK.

Senator BLUMENTHAL. So I am happy to jump into the breach, so to speak. Thank you all for being here. This is a very important topic, as you have gathered at a very busy time in our schedules, so I apologize for the lack of full attendance here. We have been talking a little bit about energy.

I want to talk about a different kind of energy, human energy. As I go around the State of Connecticut and every time I am back, which is every weekend I go back at the end of the week, I come down on Mondays, I try to visit businesses, mainly small and medium sized businesses.

And the most common refrain that I hear is, we can't find people to fill these jobs. Sometimes it is, can't find people with the right skills to fill these jobs. And in every sphere of manufacturing, I hear it again and again.

So my question, first of all, to I guess, Mr. Zakreski, because you are the one who actually runs a business here, if I am not mistaken. You are in charge of your business. And I don't know what things are like in Wisconsin, but I am wondering whether you have any thoughts about the, really the skilled workforce challenge that the United States faces today.

In my view, it is the biggest challenge of this country right now. We can talk in very abstract terms about capital, about supply chains, but if we don't have people to make things or to implement the grand designs that companies may have, big companies but also small companies, we are not going to have supply chains or manufacturing.

Mr. ZAKRESKI. Thank you, Senator Blumenthal. And I spent 8 years of my life growing up in East Hartford, Connecticut, and so it is a pleasure to actually get to meet you today.

Senator BLUMENTHAL. Wonderful.

Mr. ZAKRESKI. You are absolutely correct in the how much of a challenge it is to find people. I want to share with you a story that I can get a little emotional about, but I want to share it with you because it is important, is that we really struggle to find second and third shift people to meet the demand earlier in the year.

Working with the Wisconsin Lutheran Services and Manpower, we were introduced to some Afghani refugees who were in Wisconsin. And we were able to bring a few of them on and then a few more and a few more. We made accommodations to adjust them and help them with the culture.

We ended up with now over 20 Afghan refugees from—and who were placed in Wisconsin, rescued from a horrible situation. And that saved our rear end in the first half of the year because we were able to get the workers that we needed. But that is an example of just a creative pathway to finding help in that area.

Now, as you point your point out, besides just the operators that we needed for the second, third shift, finding engineering talent is a challenge. But there are programs that are starting to get some legs within our state, and I am sure within some of the other states, STEM programs that—programs like our Waukesha County Business Alliance have and introducing young high school kids to and elementary school kids to manufacturers and getting them excited about going in and working with automation, with other types of technologies.

So there is a lot going on. It doesn't help now, but I see a light that really kind of gives me some hope that between maybe some opportunities in our immigration policy, coupled with the opportunities that a lot of organizations are delivering, State and Federal

organizations, I see a lot of hope in the future in this space. But right now, it is a challenge.

Senator BLUMENTHAL. That is a very hopeful and in fact, inspiring answer. And I might just make the point, we have had the same experience in Connecticut with Afghan refugees. They want to work. They are thrilled to learn a skill. They are bedazzled by the opportunity to understand English and go to work.

And I might just say, although it is not directly relevant to this hearing, but for the benefit of my Republican colleagues, I am very hopeful that the bipartisan Afghan Adjustment Act will be adopted before the end of this session, because it will give those refugees a more permanent status in this country, an opportunity to continue to work for you and businesses in Connecticut and others like them around the country.

Same with Ukrainian refugees who are coming to this country, who have the same kind of work ethic and desire to learn. So I think your answer both on the general need for more skilled people with the kind of training that we can afford them, I am glad that there is a glimmer of hope, but I think we really need to focus on it.

And unfortunately, my time has expired, and colleagues have come to ask their questions. But any ideas that any of you have, if you want to submit them in writing or comment later in the course of this hearing, I think it is a real challenge, and I apologize that I don't have more time. Thank you.

Senator SULLIVAN. Thank you, Senator Blumenthal. Senator Young.

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

Senator YOUNG. Well, thank you, Chairman, for holding this hearing. I want to thank our panelists for being here today. Manufacturing is just so important to my state of Indiana. We are the most manufacturing intensive state in the country on a per capita basis.

So my constituents expect that I advocate on behalf of our manufacturing economy. Roughly a quarter of the output in my state is attributable to the manufacturing sector, and about one out of every six workers works in the sector, and of course is an important sector to our Nation's economic health and our global competitiveness as well, to say nothing of national security.

The CHIPS and Science Act is some legislation I led on in concert with Senator Schumer, and of course, now law, it as some of you know, incentivizes semiconductor companies to re-shore back here to the United States of America, and in the process, not only creates good paying jobs, will help ensure that we have a more secure supply chain moving forward.

We have had some fabs, as they are known, locate in the industrial Midwest in the wake of that announcement. SkyWater Technology in the state of Indiana, roughly \$2 billion semiconductor facility being constructed in West Lafayette, Indiana.

And then the CHIPS and Science Act has a related provision pertaining to tech hubs, that is the identification of centers of excellence, regions of excellence across the country that will be so des-

ignated as a sort of market signal so that workers in these industries of tomorrow can be trained, those areas can receive special dispensation through public law to incentivize the creation of more startup companies, and the market signal for venture capitalists to go into those designated areas and make investments.

So I have high hopes for the CHIPS and Science Act, and I wanted to ask Ms. Hines, how you believe the CHIPS and Science Act will impact our small American manufacturers, which is why we are here today to discuss them.

Ms. HINES. Thank you so much, Senator, for that question. First of all, I think it can impact small manufacturers in two ways, one of which is really expanding the MEP program through the expansion awards and helping them increase their competitiveness in supply chain workforce and technology, specifically cybersecurity.

The other one you mentioned too is the regional tech hubs. And the regional tech hubs are really important within CHIPS and Science because it kind of takes about MEP does on a state level, which is integrate local and state resources at the State level, but expands them regionally, because we know manufacturing isn't just within a state's boundaries.

Especially with the supply chain, it expands all across the country, internationally too, but I think what we need to do is really harness the integration and leverage the resources both state and locally into a more regional model so we can help support things like the semiconductor industry.

Senator YOUNG. Thank you. I find that characterization of the tech hubs helpful, and I will probably borrow that, usually without attribution as we are apt to do around here, right, and use that as I talk to constituents and colleagues. I hope I pronounce your name correctly, Dr. Shivakumar.

In your testimony, sir, you discussed the concept of innovation as a national security asset. You go on to mention that this asset has to be rejuvenated as new global realities and opportunities arise. Can you elaborate on this nexus between national security and innovation in manufacturing, sir?

Dr. SHIVAKUMAR. Certainly, Senator. The United States has an innovation system which is made up of complex networks related to manufacturers, related to research organizations, related to educational organizations, and all of these work together to support a broader innovation system.

That system has been the basis of our strong lead in technological leadership. And that technological leadership in turn, has been the basis of our military leadership and national security advantages over the past, you know, since the World War II and perhaps earlier. The point that I tried to make in my opening remarks was that the system has to adapt to new realities.

That system was predicated on a world where the United States was already in our leadership position in terms of research and science. That world has changed. We have a number of near-peer competitors, including countries that are—that have deliberate policies or deliberate strategies to work off of the investments that we make in research and development, and focus much more on the second half of the equation, which is manufacturing and commercialization of products.

So we can no longer continue to prosper in a world where we do the front end, the research and the development, and the fruits of that effort are then capitalized in other countries.

We need to build our small and medium sized manufacturers, and we need to connect them to large manufacturers, and we need to connect them to the education system, we need to connect them to the research system so that collectively that we have a strong innovation system that continues, that adapts us to the 21st century, and allows us to compete effectively, and allows us to maintain our national security advantages.

Senator YOUNG. Well, thank you. Chairman, if I could just continue with your leave, I would like to maybe tease out a few things. So if we think about this nexus, national security, innovation, manufacturing.

If we are investing in each of those areas, sometimes there is of course, important overlap. But if we are investing in that nexus as it were, or opportunities for job creation for my constituents and people across the country, that is really appealing, innovation will occur not just in kind of hard science, but also as you manufacture.

It is sort of iterative innovation, as I understand it, manufacturing innovation oftentimes, and it doesn't occur in labs, it occurs on the factory floor. And then there is a third piece that you hit on in your testimony, and that is leadership and global standards.

And you call on Congress, in fact, to secure the patent system. How does manufacturing something lead to leadership globally, as it relates to standards? And why is U.S. standards leadership so important as we look to the future?

Dr. SHIVAKUMAR. Well, standards, I think the way I understand is, you know, it is basically a technical language. If we are speaking in the language of English, we understand each other's vocabulary.

We have we share a grammar. We have idiomatic, you know, structures in our language and that helps us to communicate rapidly, easily. And the country that has, that establishes that the language of technology is the language that leads in technology.

So it is very important that we maintain that leadership because it helps us dominate the conversation. The Chinese understand this. They have a new, you know, China 2035 standard strategy.

They are working very hard to take over that conversation. We have for a long time dominated the conversation because of our natural strengths in research and development. But we have sort of taken that leadership for granted, I think, for the past few decades. That leadership is under challenge.

One of the areas where the Chinese are moving with some deliberation is in the international standards setting organizations. That requires not only NIST in terms of setting, helping small business, you know, small and large businesses develop standards cooperatively.

But it also involves, you know, our diplomatic services, our other parts of our Government to engage with these international organizations, make sure that we send people there that will pay attention to what is going on.

We understand, you know, their processes to make sure that standards, particularly in fast evolving technologies like informa-

tion technologies, communication technologies, are the ones that we are conversant with and that we are setting the conversation on.

Senator YOUNG. Thank you. And as we develop these out, of course, stitches our different partner countries together to the mutual benefit of all of us. Thank you so much, doctor.

Dr. SHIVAKUMAR. Very well.

Senator YOUNG. Chairman.

Senator SULLIVAN. Thank you, Senator Young.

Senator Blackburn.

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

Senator BLACKBURN. [Technical problems]—Hines, I want to thank you for the support that you lent to us as we were working on the MEP Supply Chain Data base Act and getting that signed into law. And as you know, this gives us, give the National Institute of Standards and Technology, NIST, the ability to establish a database that will give a national overview of the networks of U.S. supply chains.

And I would love for the record for you to give me just a quick comment on how you think this is going to be helpful, and what should the Department of Commerce keep in mind as they are implementing this?

Ms. HINES. Thank you, Senator, for the question. And I am glad to see you. And I would like to thank you, too, for your leadership on that bill. I think it is critically important that the Department of Commerce invest in a manufacturing data base. It is a tool essentially for the supply chain.

MEP is really the key program to be in position to operate that supply chain intelligence network, because we are really at the ground floor with small manufacturers all across the country. So we know their capabilities, their certifications, we know what they can do, what they can produce, and what they can support.

And there is some great examples, too. I will just give you a couple of, you know, we are sampling in this area. We have data all across the country of manufacturers everywhere. And there is a couple great examples that I can share with you.

One of which that I mentioned in our written testimony is that in the recent Ukraine conflict, that essentially we had a manufacturer in Florida that was—had some supplies being supplied from Ukraine.

Obviously, when that conflict broke out, they had to find new suppliers and quickly. And what they did is they looked into a local database that is right now in existence in Florida and found other suppliers, and I think actually found some suppliers in Indiana, for those parts. So it is really, really important.

They also use that intelligence network, again, to find those ventilators supplies to respond to Hurricane Ian. And so it is really critically important, the database as a tool, that is really an intelligence network the MEP program can provide because of our access to small manufacturers across the country.

Senator BLACKBURN. Well and thank you for that. And right along with that on the supply chains is workforce. And Senator

Rosen and I have done the Advanced Manufacturing Jobs in America Act that would put some pilot programs in place.

We have got 153,000 Tennesseans that work in advanced manufacturing, and we have had recently 36,000 advanced manufacturing-related graduates since 2016. So we are picking up the pace there.

But talk a little bit about what we need to see in collaboration with higher-ed, with industry, with the MEPs so that we can incentivize this advanced manufacturing workforce? And Ms. Hines, I am throwing that one to you.

Ms. HINES. Thank you Senator. There is many things we can do. One thing that we are doing across the country in a kind of smaller scale at this point is MEP centers are working with their local community colleges to develop curriculums where we can actually put a workforce in place, where we can look for what the needs are of the manufacturing industry.

They can actually get accredited courses and be skilled in what the manufacturing industry needs. So that is obviously one. The other big issue that we have is recruitment, and the MEP program across the country is really working with K-through-12 students in a lot of different really kind of interesting programs across the country.

Again, they are kind of smaller, individual within the state. So the MEP—the CHIPS and Science Act would allow us to expand those programs to scale. So there is a multitude of things that we can do, from recruitment, to upskilling, to working with our local community colleges, and really trying to skill the workforce that our manufacturers need.

Senator BLACKBURN. Thanks. Mr. Vasko, let me come to you. Good to see you today. And let's talk about Manufacturing USA for a moment.

As we have worked with small business manufacturers in Tennessee, I was interested to note that 50 percent of most of the new business formations fail within a 5-year period of time.

Some of this is lack of resources, lack of funding. But I would like to hear from you. How is Manufacturing USA using their resources and their experience to help these startups and these small businesses that are trying to grow?

If we are going to bring manufacturing back from China, back from India, then it is going to be important that these new start companies be able to support themselves and last longer than 5 years.

Mr. VASKO. Thank you for the question, Senator Blackburn. That is an excellent question. And you look at what the Manufacturing USA institutes do, they de-risk technologies. They take things, from technology—levels which are actually very, very risky, and they work, and they work, and they try to operationalize that so people can adopt those technologies.

And that is important for people adopting those and trying to build businesses around those technologies to have those technologies de-risked. That is what Kelvin does in his institute. What happens in all 16 of the institutes.

And that is so incredibly important to be able to take that technology, get it ready, do demonstrations, how it can be used, have

the support there, and then using the—leveraging the MEPs and the tech hubs, push that out to a wider audience, and that really forms that safety net, helping those vendors to be successful—those manufacturers to be successful.

Senator BLACKBURN. Thank you for that. Thank you, Mr. Chairman.

Senator SULLIVAN. Thank you, Senator Blackburn. Let me conclude with just a few more questions. Dr. Lee, your opening testimony on the trade deficit that kind of spiked despite the fact that we were the, really originators of biopharmaceuticals, was—those are shocking numbers. And I am just curious if there is a lesson there.

Well, first, why did that happen? And then, is there a broader lesson there that we can learn from and try to rectify what seems to be a real challenge, where we started out as the innovator and now we are the big importer.

Dr. LEE. Yes. Thank you for that question. It is really shocking when you hear those numbers and you look at the trajectory, and it is not—if you were to look at the data, it is a trend, it is not a spike even.

So, I think there are some lessons learned. I think when you look at where those factories are being built, where the companies are going to actually do their manufacturing, they are placing those factories in countries that have a workforce. I have been visited by many people from different countries and they talk about what their strategies are and kind of compare notes.

And in one example, I won't go into any details except to say their strategy is that when they are talking to a company and they are trying to convince them to build that factory, they will tell the company, we will find you x number of workers that meet your needs in terms of their skills.

And if you don't like some of them, we will find more to replace them. So I think the whole conversation that all of us have touched on, on the importance of workforce and ensuring we have a workforce with skills, is a very important problem that we have to solve. And it is not a simple problem to solve because it is not just this organization or that part of the Government can solve it.

I think it is a whole of Government strategy to reset what we are doing and create that workforce that is going to want to incentivize organizations to be here. I think there is another piece of this which is, I think there is an interest for companies to try to build their next factories closer to their R&D sites.

Yes, but in order to do that, they want to see that the return on investment is going to be there. They want to see a supportive and nurturing environment. And they want to have access to not only the best workers, but they want to have access to the best technologies. And that is where our opportunity lies.

Other countries, and we have talked about a lot of them here, are investing in that middle stage of technology readiness and maturing them. And that is the piece that has been missing here for a long time, until programs like the Manufacturing USA program were created, and they were expressly created to begin to move the needle in that space. And I personally don't think we invest enough.

I think there is a lot of untapped potential, but I think we are seeing the value that these programs are creating. So I am looking forward, I am excited about what the future can bring as long as we can have the right kinds of strategies to meet the needs.

Senator SULLIVAN. Good. Let me ask two final questions. One is really a follow up to what you just mentioned, and I will pose them to all the witnesses today. But let's go back to the issue of workforce and the challenges we have heard from Senator Blumenthal, and the Afghan refugee issue is an idea.

Some of what you just mentioned, Dr. Lee. Mr. Vasko, in your testimony, you touched on a topic that is very near and dear to my heart, and that is this pathway that you look for as it relates to bringing American military veterans into manufacturing and good training. I think it is a very good match.

I serve on the Veterans Affairs committee. I serve on the Armed Services committee. I have been trying to look at ways in which we can really streamline the ability of our young men and women who are getting out of the military to go into manufacturing, to get the training, to get into apprentice programs or good union programs. What has been your experience in that regard?

You know, these young men and women are disciplined. They know how to get up early. They know how to show up for work. They know what it is like to work 12 and 15 and 20 hour days when you are deployed. So what are some of the other ideas that we have here from you but others on the workforce challenge?

Mr. VASKO. Yes, Senator Sullivan, we—I totally agree. And I have to say that it is a shame that many of our military veterans are underemployed when they leave. They may have really high tech careers in the military. They have skills, leadership skills, responsibilities which are unimaginable. So—

Senator SULLIVAN. I will tell you—I am a Colonel in the Marines. I had a, many years ago, a young Marine Sergeant getting out, right. And he—you know, I would check out with all my guys and women.

And he said, well, sir, you know, I really don't have much of a background and training, and this guy was a combat vet. Led combat missions in Afghanistan, awards for valor. I said, you have a better education than a Harvard MBA. You do. It is a fact. You have more experience, more leadership.

Some of them don't know it, though, either right. And that it is kind of—we need to work more on it.

Mr. VASKO. Absolutely. Absolutely. So I think there are things we could do to bridge that gap. And part of it is just perception. You may see a skill used in the military and not see how it could really have relevance in the commercial environments. We actually have a program that bridges that gap, a 12 week program where hands on, they use manufacturing equipment. 30 percent—

Senator SULLIVAN. Is that while they are still on active duty and then they are allowed to do that or once they get out?

Mr. VASKO. No. After they retire, yes. And we—it is called the Academy for Advanced Manufacturing. And we are able to transition people very quickly from that. And 95 percent of them get a job walking out of that.

Senator SULLIVAN. That is great.

Mr. VASKO. The participation there is actually even paid. The people that are hiring them pay for the all the schooling and they get a stipend.

Senator SULLIVAN. I bet the employers who hire them love them.

Mr. VASKO. They love them. You wouldn't believe how many people come back and hire more and more and more. And it is, but you are right. Those are—

Senator SULLIVAN. If you could submit for the record some of the information on that program.

Mr. VASKO. I will do that.

Senator SULLIVAN. Good.

Mr. VASKO. We have a great deal. I will submit that for you.

Senator SULLIVAN. Perfect. Anyone else on just innovative ideas to address this big challenge we have on manufacturing? Dr. Shivakumar.

Dr. SHIVAKUMAR. Yes. I think, Senator, you hit the nail on the head in terms of identifying that veterans have many of the soft skills that employers are really looking for. There are a number of initiatives that are underway or could be supported.

One is, you know, create a curriculum for veterans even when they are—or for our servicemen and women, even while they are in service so that they are prepared for a transition into civilian life.

We need to provide better transition support from the military to civilian life. Part of that is also to create a system where the experiences that they have had while in service are transferred into something that the civilian marketplace understands and values.

Senator SULLIVAN. Right. Yes. It is not always as easy as it sounds.

Dr. SHIVAKUMAR. That is true. And the final point I would add is to provide support for military spouses. In many cases, you know, if you are a spouse of a service man or woman, and your wife say is, or your husband, is a hairdresser in one state, that—the license to cut hair or style hair in another state doesn't transfer across state lines.

And so that is a huge disincentive, and it is something that, you know, our service families really struggle with. Creating—and I understand that, you know, this is sort of a local jurisdiction, but at least for military families, if there was some sort of Federal provision where these credentials could be carried across States, it would be really helpful for our service families.

Senator SULLIVAN. Good. Any other thoughts? Yes, Dr. Lee.

Dr. LEE. I think you raise a really important point. And so my response is kind of there are two elements. One is I think there are many very good pilot or existing programs that we need to ensure that we can scale as successes.

And so one of my sister institutes, Lift, they run a program called Operation Next. And it takes service members who are in the last 6 months of their duty and gives them the skills to work in a manufacturing environment, so that when they are done with their service, they then have the skills—

Senator SULLIVAN. Could you submit the information for the record—

Dr. LEE. Yes, I will follow up in writing with some information about that.

I think the other piece, though, is while we have to have those regional, those local, those skill specific kinds of opportunities and try to scale them, I do want to go back to my earlier comment and say, I think we still have a perception problem, that manufacturing can be a career. It is not just a job and a set of skills, it can be a career.

And I think if we can think about a national strategy to reset that mindset, we might see a greater interest by the workforce.

Senator SULLIVAN. Great. Ms. Hines, do you have a comment?

Ms. HINES. Yes. I want to take kind of a little turn on some things that we have seen with veterans, especially returning from overseas, is they are actually very innovative in their experiences.

They come back and they say, I needed this or I want to do this. So we have actually worked with a lot of manufacturers across the country who have an idea and bringing that idea to market. And it is based on their experience.

So and it is really the nuance of what we do because they are really a small, small kind of company, but it makes a huge impact. So it is definitely a little nuanced on the training.

Senator SULLIVAN. Yes. Good. Let me ask one final question, and I again, I will throw it out to everybody, and it is, you know, I think that we have all awoken to this idea of being too over reliant, particularly on Communist China and the risks that that entails, right.

Xi Jinping could wake up tomorrow and say, hey, I don't like this sector, and, you know, there would be a problem if you are getting your supplies from there. So this idea of strategically decoupling the U.S. and our allies' supply chains from overreliance on China, but of course, we are not going to be able to manufacture everything in the United States.

So how do you go about thinking about the balance of supply chains? There is this big push to, you know, onshore or do it with our allies, which I fully support, and I think you are seeing here is a very bipartisan.

But what are the lessons there from your own personal experiences, and how do we do that balance to make sure that it is a strategy that could work? And there is a lot of nuances here. It is one thing to say, all right, we have got to strategically decouple from China. I agree with that. But in practice, what are the key elements of the factors we need to consider, particularly as it relates to legislation but what you have also seen in your own experience?

And Dr. Shivakumar, why don't we begin with you, sir, because I know you have been thinking a lot about this topic. And then if anyone else has views on this, I would welcome it.

Dr. SHIVAKUMAR. No, we do have a strategic vulnerability in terms of the fact that we are heavily dependent on a variety of products that are manufactured in China.

There is this topic about decoupling, but if we actually look at, you know, go back two or 3 years in terms of the manufacturing, almost everything that we can think of that we wear, see, drive, talk about has some element that has been—that involves China

in the network of activities that have produced a product or service.

I think decoupling is going to be extremely slow and painful. If we try to do—if we think of decoupling as pulling, you know, the plug out of here and putting it into that, I think what we need to do is actually accelerate our own growth in terms of the discussion we were having here, in terms of growing our own innovation ecosystem, in terms of building our own networks, our own strengths.

And I think, you know, there is a growing awareness among established firms worldwide of the real dangers of operating in China. Most companies have either an alternative plan or exit plan from China.

We have a golden moment in the sense to really invest in our own innovation capacities, our own manufacturing capacities, so that we are growing those new neurons, if you will to use that analogy, of—well, the links to the other system, the existing system, slowly, you know, wither away. But we need to do that now.

And this is, I think a lot of the legislation that has been passed is very much in that direction. What my concern is that the Congress maintains its commitment to growing our innovation ecosystem over a sustained period of time.

You know, you can't have MEP funded at this level 1 year then this level next year, or even our Manufacturing USA network. We have a very small, relatively small initiative there. The Chinese have looked at our program. They have—they like it and they have scaled it up enormously.

Our system is sort of inspired by the German model, and the German model is many times what our system is. So we have—you know, we need to think about our innovation system much in this way in which we talk about national security in terms of ships and aircraft carriers and planes. We are still thinking very small.

Senator SULLIVAN. Yes.

Dr. SHIVAKUMAR. We need to think much larger. And we didn't—we haven't prevailed over the past so many decades since the World War II by thinking small about our national defense. But what we continue to think small about how much we fund MEP, and Manufacturing USA, and a whole series of other efforts to build our innovation workforce and so on and so forth.

So I think we need to—our metaphor we have in mind, we need to be much more, thinking in terms of a, you know, a rebirth, a major investment in ourselves. And I think that is the way to go forward.

Senator SULLIVAN. Good. Anyone else? Thoughts? Ms. Hines.

Ms. HINES. I think one aspect that you talked about, too, about decoupling, which is really important, is risk mitigation. You have to really look at the supply chains. We are not going to necessarily be able to decouple in all cases.

What we can do is really mitigate the risk and say we have a supplier that is overseas here. Let's identify another one as a backup or one that can retool and make something, should that one where crisis come into play.

So I think that is a really important point of what we need to do, especially for small manufacturers that really have no idea. You know, they get their source, one supply from one source. They

aren't looking at the big supply chain and the risks associated with that.

Senator SULLIVAN. Right. Dr. Lee.

Dr. LEE. Yes. I just want to reflect for a minute that, you know, as you go deeper into the tiers of supply chains, not only do they get very complicated, but the supply chains for the products that we buy in the stores end up being intermingled in part of the same supply chain that also feeds our military and our national defense.

So I think it is critical to think about how we can ensure that we have that capability more local. But I also want to amplify the comments about ensuring that we are what I would call a wellspring of innovation.

You know, I often have conversations about how are you going to prevent this technology from going overseas. And at the end of the day, I don't know that you can over time. As things mature, they move on.

What we can do as a country is ensure that we are always going to be that heart of innovation, that wellspring of innovation, and that is going to attract the kinds of organizations, companies, and supply chain that we need for our own future.

Senator SULLIVAN. Right. Good. Mr. Zakreski.

Mr. ZAKRESKI. So I will give you a bit of the kind of the hard realities of some of this is that there are some parts that some people here in the U.S. just don't want to make. And it is hard to find people here to make them.

Senator SULLIVAN. Right.

Mr. ZAKRESKI. We buy parts from overseas. We have to because we have not been able to find people who want to make the investment to deliver the kind of quality and expectations that we have for the parts. So we have to go and have had to go overseas for those parts. That is a big challenge is to create an awareness that there are potential suppliers out there who maybe can help.

I mean, and that is where maybe the database that we had talked about through the MEP can come into play and help out for—help somebody like us to say, oh, wait a minute, there is somebody down in, you know, the Northern part of North Dakota or some part in Anchorage that can help us out. And we need to have that data, because if you don't find it, it is really hard to find that resource.

And it is—the other part of it is, it is really hard if you have parts over there to move them back, especially in the automotive industry. You have to go through tons of validation and extra work, and it can take a year to resource a part and an awful lot of your technical resources away from developing opportunities for new business to re-source a part from overseas back to here, so that when you get your car that annoying little check engine light doesn't come on.

And so, it is a challenge.

Senator SULLIVAN. Good. Mr. Vasko, do you want to close on that topic?

Mr. VASKO. Sure. The one thing I would add is we need to consider flexibility as well. So we have done a lot to optimize our manufacturing operations, but many times to the detriment of flexibility.

And we found that flexibility really provides a lot of opportunities. You may still be able to produce many other products with the equipment, with the parts you have, and really developing that into our manufacturing.

As we customize more, that sort of flexibility is going to be required for American manufacturers to be successful. So that is the one element I would add and make sure we consider that as well.

Senator SULLIVAN. Great. Well, listen, thank you very much for the discussion, and it was great. And I think you are seeing a lot of good ideas on both sides of the aisle here.

I want to just mention the additional questions you might be getting from the Committee. Senators have until December 20 to submit additional questions. The hearing record for this hearing will remain open until the 27th of December.

And I ask the witnesses to respectfully try to respond to those questions by the 27th. I am sure as you are having Christmas with your family, you are going to be really focused on these questions. I am just kidding.

But I want to thank you again. Great discussion, and I am looking forward to getting some of the things that I have requested for in terms of the hearing. This concludes our hearing. Thank you.

[Whereupon, at 3:35 p.m., the hearing was adjourned.]

